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Tree Farm Licence 56

Issued to Revelstoke Community Forest Corporation

Rationale for Allowable Annual Cut (AAC) Determination

Effective April 18, 2001

Ken Baker
Deputy Chief Forester

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Objective of this Document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for Tree Farm Licence (TFL) 56. This document also identifies where new or better information is needed for incorporation in future determinations.

Description of the TFL

TFL 56, held by the Revelstoke Community Forest Corporation ('the licensee'), is situated along the Columbia River in the West Kootenays. It lies within the British Columbia Forest Service (BCFS) Nelson Forest Region and is administered from the Columbia Forest District Office in Revelstoke. Adjacent to the TFL are the Revelstoke and Golden timber supply areas (TSAs), as well as TFL 55 and Glacier National Park.

TFL 56 covers 119 748 hectares, approximately half of which is forested. The landbase is extremely rugged, mountainous terrain with elevations ranging from 573 to 3050 metres. The forested portion of the TFL is largely located in the Interior Cedar-Hemlock (ICH) and the Engelmann Spruce Subalpine Fir (ESSF) biogeoclimatic zones. Major tree species on the TFL include western redcedar, western hemlock, Douglas-fir, spruce and subalpine fir (balsam). Important wildlife species in the vicinity of TFL 56 include grizzly bear, black bear, moose, deer and caribou. The streams and lakes on TFL 56 support many resident fish species including rainbow trout, bull trout, kokanee and mountain whitefish.

Revelstoke, located forty kilometres to the south, is the only major community in the proximity of the TFL. Timber harvested from TFL 56 primarily supplies mills in this community.

History of the AAC

Prior to 1992, TFL 56 was a part of the northern block of TFL 23, which at the time was a large licence in both the Columbia and Arrow Forest Districts and held by Westshore Terminals Ltd. In 1992, TFL 23 was subdivided, and the northern block became TFL 55. The new TFL 55 remained with Westshore Terminals Ltd, and an AAC of 220 000 cubic metres was approved.

In 1993, Westshore divested itself of its former holdings and TFL 55 was subdivided into two roughly equivalent areas. The northern portion remained as TFL 55 and was assigned to Evans Forest Products Ltd. The southern portion became TFL 56 and was assigned to the Revelstoke Community Forest Corporation, a corporation newly formed in 1993 to manage and operate the TFL. The former AAC of 220 000 cubic metres was divided equally between the two licences, with a total AAC of 110 000 cubic metres for TFL 56.

Effective May, 1996, the chief forester determined a new AAC for TFL 56 of 100 000 cubic metres. This AAC included a partition of 10 000 cubic metres attributable to timber classified at that time as inoperable (i.e., in stands outside the 1994 operable cut line).

New AAC determination

Effective April 18, 2001 the new AAC for TFL 56 will be 100 000 cubic metres, unchanged from the current AAC.

This AAC will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Information sources used in the AAC determination

Information considered in determining the AAC for TFL 56 include the following:

- *Statement of Management Objectives, Options and Procedures (SMOOP) for draft Management Plan No. 3,* TFL 56, accepted November 15, 1999;
- *Timber Supply Analysis Information Package*: *TFL 56*, Management Plan No. 3, Revelstoke Community Forest Corporation, accepted August 1, 2000;
- Existing stand yield tables for TFL 56, approved by BCFS Resources Inventory Branch, June 5, 2000;
- Managed stand yield tables and site index curves, approved by BCFS Research Branch, August 1, 2000;
- *TFL 56 Inventory Audit*, BCFS Resources Inventory Branch, February, 1999;
- *Timber Supply Analysis Report: TFL 56*, Management Plan No. 3, Revelstoke Community Forest Corporation, accepted February, 2001;
- *Management Plan No. 3: TFL 56*, Revelstoke Community Forest Corporation, submitted February 2001, accepted April 2001;
- *TFL 56, Twenty-Year Plan*, Revelstoke Community Forest Corporation, accepted January, 2001;
- Summary of public input solicited by the licensee regarding the contents of Management Plan No. 3;
- *Landscape Unit Planning Guide,* Province of British Columbia (B.C.), March 1999;
- *Higher Level Plans: Policy and Procedures,* BCFS and Ministry of Environment, Lands and Parks (MELP), December 1996;
- Technical review and evaluation of current operating conditions on TFL 56 through comprehensive discussions with BCFS and MELP staff, notably at the AAC determination meeting held in Victoria on February 7, 2001;
- Technical information provided through correspondence and communication among staff from BCFS and MELP;
- *Revelstoke and Area Land Use Planning, Minister's Advisory Committee – Final Recommendations*, October 1999;
- Memorandum of Understanding between Ministry of Forests and Ministry of Environment, Lands and Parks regarding instruction for the preparation of the 1998 Forest Development Plans, October 1997;
- Letter from the Chief Forester to Revelstoke Community Forest Corporation regarding the TFL 56 forest cover inventory, dated November 23, 1999;

- Letter from Timber Supply Branch to Revelstoke Community Forest Corporation regarding consideration of the MAC recommendations in the timber supply analysis base case, dated December 7, 1999;
- *Revelstoke Community Forest Corporation Caribou, Biodiversity, and Ungulate Analysis*, 1999;
- Letter from the Minister of Forests to the Chief Forester, dated July 28, 1994, stating the Crown's economic and social objectives;
- Memorandum from the Minister of Forests to the Chief Forester, dated February 26, 1996, stating the Crown's economic and social objectives with regard to visual resources;
- *Forest Practices Code of British Columbia Act*, consolidated to March 2001;
- *Forest Practices Code of British Columbia Act Regulations and Amendments*, current as of March 2001;
- *Forest Practices Code of British Columbia Guidebooks*, BCFS and MELP;

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis, and the inventory and growth and yield data used as inputs to the analysis, typically form the major body of technical information used in AAC determinations. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as the rate of timber growth and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variations in physical, biological and social conditions, although ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the social, cultural and economic factors that are relevant when making forest management decisions. Therefore, technical information and analysis do not necessarily provide complete answers or solutions to forest management problems such as AAC determinations. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information required to be considered in AAC determinations.

In determining the AAC for TFL 56, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider particular factors in determining AACs for TSAs and TFLs. Section 8 is reproduced in full as Appendix 1.

In accordance with Section 23(3) of the *Interpretation Act*, the deputy chief forester is expressly authorized to carry out the functions of the chief forester which include those required under Section 8 of the *Forest Act*.

The chief forester has expressed the importance of consistency of judgment in making AAC determinations. I also recognize the need for consistency of approach. I have observed the chief forester during a number of previous AAC determinations and am familiar with the guiding principles that the chief forester has employed in making AAC determinations. I find these principles to be reasonable and appropriate and I have employed them as described below in making my AAC determination for TFL 56.

Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. When a large number of determinations are made for many forest management units over extended periods of time, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainty. To make his approach in these matters explicit, the chief forester has compiled a set of guiding principles for AAC determinations. I have reviewed these principles and find them to be reasonable, and thus I have adopted and applied them as deputy chief forester in AAC determinations for TFLs. These principles are set out below. If in some specific circumstance it may be necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

(i) minimizing risk, in respect of which in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and

(ii) redetermining AACs frequently, to ensure they incorporate current information and knowledge, a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires the chief forester to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to increase the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or to factors that could work to reduce the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the *Forest Practices Code of British Columbia Act* and its associated regulations (the Forest Practices Code).

The *Forest Practices Code of British Columbia Regulations* were approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995.

Although the Forest Practices Code has been fully implemented since the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination the chief forester takes this uncertainty into account to the extent possible in the context of the best available information. In making my determination for TFL 56, as deputy chief forester, I have followed the same approach.

As British Columbia progresses toward completion of strategic land use plans, the eventual timber supply impacts associated with the land-use decisions resulting from the various planning processes—including the Commission on Resources and Environment (CORE) process for regional plans, the Protected Areas Strategy (PAS) and the Land and Resource Management Planning (LRMP) process—are often discussed in relation to current AAC determinations. Since the outcomes of these planning processes are subject to significant uncertainty before formal approval by government, it has been and continues to be the position of the chief forester that in determining AACs it would be inappropriate to attempt to speculate on the timber supply impacts that will eventually result from land-use decisions that have not yet been taken by government. I consider this approach to be reasonable and appropriate. Like the chief forester, therefore, I will not take into account the possible impacts of existing or anticipated recommendations made by such planning processes, nor attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impact in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five–year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

However, where specific protected areas have been designated by legislation or by order in council, these areas are no longer considered to contribute to the timber supply in AAC determinations.

For the area of TFL 56, government's approval of the Kootenay-Boundary Land Use Plan (KBLUP) in 1995, and decisions on protected areas have clarified many aspects of land and resource use and management. Following the approval of the KBLUP, government appointed a community committee known as the Revelstoke and Area Land Use Planning Minister's Advisory Committee (RMAC). The RMAC was tasked to begin to implement the West Kootenay Land Use Plan (a subset of the Kootenay-Boundary Land Use Plan) for Revelstoke and area (including TFL 56) by developing strategies

which address the values identified. The RMAC submitted the *Revelstoke and Area Land Use Planning Final Recommendations* in October 1999. The province announced on April 17, 2001 that the Minister of Forests and the Minister of Environment, Lands and Parks had endorsed these recommendations.

The Kootenay-Boundary Higher Level Plan Order promulgated by Ministers in December, 2000 specifically does not apply to the area covered by the RMAC process.

Forest Renewal BC funds a number of intensive silviculture activities that have the potential to affect timber supply, particularly in the long term. As with all components of an AAC determination, like the chief forester, I require sound evidence before accounting for the effects of intensive silviculture on possible harvest levels. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to redetermine many outdated AACs in the province between 1992 and 1996. In any case, the data and models available today are improved from those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, the chief forester should immediately reduce some AACs in the interest of caution. However, any AAC determination made by the chief forester or myself must be the result of applying our individual judgment to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from recent court decisions including those in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting those obligations under these decisions, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within TFL 56.

With respect to future treaty decisions, as with other land-use decisions it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from decisions that have not yet been taken by government.

Overall, in making this AAC determination, as the deputy chief forester, I am mindful of the chief forester's obligation as steward of the forest land of British Columbia, of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of the chief forester's responsibilities under the *Forest Practices Code of British Columbia Act*.

The role of the base case

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the work of the Timber Supply Review program for TSAs and TFLs.

For each AAC determination for a TFL, a timber supply analysis is carried out by the licensee using an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model, a series of timber supply forecasts is produced, reflecting different starting harvest levels, rates of change over time, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen which attempts to avoid excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. This is known as the 'base case' forecast, and forms the basis for comparison when assessing the effects of uncertainty on timber supply.

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast for a TFL is not an AAC recommendation. Rather, it is one possible forecast of timber supply, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it. In some cases, an AAC is determined that coincides with the base case starting harvest level. In other cases, an AAC is determined which differs significantly from the initial level modelled.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are realistic and current, and the degree to which its predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are made on the basis of informed judgment, using current available information about forest management, which may have changed since the original information package was assembled. Forest management data are particularly subject to change during periods of legislative or regulatory change, such as the enactment of the Forest Practices Code, or during the implementation of new policies, procedures, guidelines or plans.

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgment and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgments that may be based in part on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined.

Timber supply analysis

The timber supply analysis for TFL 56 was prepared by Silvatech Consulting Ltd. under the direction of licensee staff. Forest Planning Studio (FPS–ATLAS), a spatially explicit forest level simulation model developed at the University of British Columbia, was used to provide the timber supply forecasts. FPS-ATLAS is designed to schedule harvests according to a range of spatial and temporal objectives assigned to stands. The forecasts from the timber supply model were reviewed by BCFS staff knowledgeable about the model. These staff were able to advise me about the function of this model, and any associated implications for harvest projections.

The timber supply analysis assumptions incorporated the forest management recommendations arising from the Revelstoke and Area Land Use Planning Minister's Advisory Committee (RMAC). I have found this to be a reasonable approach because it is evident that operational planning and statutory approvals have, for several years, unfolded essentially in harmony with the RMAC recommendations. I accept the use of these modelling assumptions in the estimation of available timber supply on TFL 56, and my considerations of these assumptions are discussed throughout this document.

The base case prepared on behalf of the licensee projected an initial harvest level of 100 000 cubic metres per year, a level that is the same as the current AAC. The initial harvest level was maintained in the base case for two decades before dropping over a period of four decades to a long-term harvest level of 74 100 cubic metres per year.

In the timber supply analysis, various sensitivity analyses were conducted to assess the potential implications for timber supply arising from uncertainty in data assumptions and estimates. These analyses have also assisted me in considering the factors leading to my determination.

As discussed and quantified throughout this rationale, and in consideration of the items described above, I am satisfied that the information presented to me provides an adequate basis from which I can assess the timber supply for TFL 56 for this determination.

Consideration of Factors as Required by Section 8 of the *Forest Act*

Section 8 (8)

In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

i) the composition of the forest and its expected rate of growth on the area,

Land base contributing to timber harvesting

- general comments

The total area of TFL 56, as estimated from the licensee's inventory file, is 119 748 hectares. For this analysis, data indicated that 49 percent of this area is considered to be productive forest land.

As part of the process used to define the timber harvesting land base (i.e., the land base estimated to be biologically and economically available for harvesting), a series of deductions was made from the productive forest land base. These deductions account for the factors that effectively reduce the suitability or availability of the productive forest area for harvest for ecological or economic reasons. For TFL 56, the deductions result in a timber harvesting land base of 20 513 hectares, or approximately 35 percent of the productive forest land.

My consideration of the deductions applied in the derivation of the timber harvesting land base is presented in the following sections of this rationale.

- non-productive and non-forested reductions

In the timber supply analysis, the licensee deducted areas classified in the inventory file as non-forested or non-productive—alpine, alpine forest, lake, non-productive, river, swamp, roads, or mining areas—from the land base assumed to contribute to timber supply. Approximately 59 779 hectares were excluded in the analysis on this account.

The licensee suggests that approximately 90 hectares including the Goldstream mine and power line corridor could be considered for inclusion in the timber harvesting land base. However, district staff indicate that no definite closure schedules are available for this mine. Further, staff are uncertain if the areas can truly be restored to productivity. From review of the information, I am satisfied that it would be inappropriate at this time to consider timber supply contributions from this area.

The BCFS Resources Inventory Branch conducted an inventory audit for the TFL, the results of which were published in February 1999. Among other things, the audit assessed the non-forest classification for TFL 56. The audit found that the non-forest classification in the inventory file did not meet provincial standards.

The licensee has subsequently reviewed and refined the data for non-forested areas on TFL 56. The refinements included reclassification of areas both to and from the non-forested category. However, the licensee indicates that the net result is an increase of 913 hectares in the area classified as forested compared to the inventory. The identification of the additional hectares is due in part to the larger scale and better resolution available from the orthophotos, which allows for more detailed mapping of such areas as small tree islands in slide chutes and the refinement of forest edges.

However, the proportion of this area that might be suitable to contribute to timber harvesting land base is uncertain. Areas not appropriate to provide timber supply contributions may be suitable to contribute to old seral retention targets. Theoretically, this could act to increase the size of the timber harvesting land base given the methodology used to model landscape level biodiversity requirements (as discussed under *landscape level biodiversity*). The licensee has estimated that 50 percent of the area, or approximately 455 hectares, may be suitable to consider as timber harvesting land base or to meet biodiversity requirements.

Without specific data, however, district staff are not convinced that an estimate can be made. They suspect that many of the additional hectares are high elevation areas, which are likely classified as parkland under biogeoclimatic mapping guidelines, and in which

harvesting would not be permitted under the caribou habitat guidelines described in the RMAC (see *Revelstoke and Area Land Use Planning Minister's Advisory Committee*) draft recommendations. An additional consideration is the contribution of slide chute areas to grizzly bear habitat requirements, which may also preclude harvest on these additional hectares. District staff estimate that very few of the areas are truly available or suitable as timber harvesting land base.

In addition, I note that due to an overestimation in the area reserved as Mature Forest Retention Areas (MFRAs) which is discussed later in this document, the amount of area assumed to contribute to landscape level biodiversity requirements is already greater than required under provincial policy. Therefore, these additional forested areas would not serve to relieve any areas from landscape level biodiversity constraints.

In consideration of the information presented, I generally accept that the information used in the base case to account for non-productive and non-forested areas represents the best available information. Until the licensee has properly reassigned these areas to the appropriate classification, I find the information provided is too uncertain for inclusion in this determination.

As a result, I make no adjustment on account of this factor for this determination. However, I suggest that the licensee further assess these areas in light of the considerations mentioned above, prior to the next timber supply review for TFL 56. If data indicate any of these areas are indeed suitable to include as timber harvesting land base, this information can be incorporated into future analyses.

- economic and physical operability

Those portions of the TFL that are not physically accessible for harvesting, or that are not expected to be feasible to harvest economically, are categorized as inoperable and are excluded when deriving the timber harvesting land base. A total of 21 661 hectares were excluded as inoperable in the timber supply analysis for TFL 56.

In the analysis for the previous determination, the licensee used an operable cut line (OCL) defined in 1994 to describe the conventionally operable land base. BCFS staff expressed uncertainty as to whether this operability mapping fully represented the operable land base. In his 1996 AAC determination, the chief forester included a partition of 10 000 cubic metres predicated on harvest obtainable from areas beyond this OCL. In consideration of the uncertainty around the operability mapping, the chief forester also requested that the licensee complete 'a revised operability map that reflects current technology, market conditions and biophysical considerations'.

The licensee has defined a new operability line for the 1999 analysis, based on a comprehensive total chance planning exercise in which harvesting systems, economics, soil stability and access were considered. The newly defined operable land base totals 37 348 hectares, an increase of 11 022 hectares over the operable land base defined for the previous analysis. The larger area includes approximately 2800 hectares more area classified as operable using helicopter harvesting than at the time of the previous determination. Under the new operability classification, the areas to which the partition was established in the 1996 determination are considered to be conventionally operable.

District staff state that the licensee has fully performed in the partitioned area over the term of Management Plan No. 2. My considerations of the licensee's performance is discussed later in this document under Partitioned component of the harvest.

District staff indicate that the operability mapping is very detailed, and provides a good representation of areas expected to be operable on the TFL 56 land base. In its operations, the licensee has consistently demonstrated an ability to harvest in the majority of stands included in the operable land base. The new operability mapping was approved by the district manager in May 2000.

However, district staff have one concern related to the newly defined operable land base. Approximately 656 hectares of age class 8 and 9 hemlock-leading stands are currently classified as operable through the use of helicopter harvesting methods. Hemlock is currently considered the lowest value species on TFL 56, and typically harvest of this species is on the margin of economically viable operations. Staff question whether these stands will in fact be economical to harvest, in particular using the more expensive helicopter-based harvesting methods.

A sensitivity analysis provided by the licensee showed the impact of excluding the 656 hectares, which represents 3 percent of the timber harvesting land base. The results show that short-term timber supply may be impacted by 1 percent if these areas are excluded.

However, the licensee states that it has extensively reviewed these stands, including assessment through the completion of total chance planning exercises, and asserts that the stands are harvestable. The licensee indicates in Management Plan No. 3 that it is willing to report annually on its performance in these and other marginal forest types.

I have considered the information regarding the operability information used in the timber supply analysis. Overall, I accept that the 1999 operability mapping represents the best available information and is suitable for use in this determination.

With respect to the operability of the hemlock-leading stands in question, I conclude that it is reasonable to assume, based on the licensee's history of performance, that it may very well be able to harvest in the stand types currently included in the operable land base. Given this, and the licensee's commitment to report on performance, I do not believe a partition to these areas is warranted for this determination.

I accept the licensee's commitment to report on its performance in these marginally economic stands over the term of Management Plan No. 3. I note that if these stands are found to be inoperable over the term of this determination, they should be excluded from contributing to timber supply in a future analysis.

- roads, trails and landings

In the analysis, a percentage of the productive forest considered available for harvesting was excluded to account for loss of productive forest land as a result of the construction of roads, trails and landings. Separate estimates were made for existing roads, trails and landings, and future roads, trails and landings, to reflect both potential changes in road building practices and road network requirements over time, and the access that the

existing network of roads will provide for future harvesting operations. Estimates account for the area that is permanently removed from the timber harvesting land base.

The licensee identified a total of 840 hectares of existing classified roads in the inventory file, and excluded these hectares in the derivation of the timber harvesting land base under *non-productive and non-forested reductions*.

To account for existing unclassified roads on TFL 56, the licensee used a Geographic Information System (GIS) to apply to the roads that are represented as lines in the database the widths estimated to be non-productive for both primary and secondary logging roads. The licensee then calculated the areas and excluded them in the derivation of the timber harvesting land base, for a total reduction of 958 hectares following other reductions.

The licensee did not make any explicit exclusions to account for existing trails and landings. Licensee staff stated that the loss of productive forest land resulting from these structures was accounted for indirectly through the exclusions for future roads, trails and landings, as discussed below.

Licensee staff reviewed silviculture prescription data from a three-year period and used samples from existing roads, trails and landings in order estimate the area that will be needed for future roads, trails and landings. The review and sampling indicated that 6.9 percent of the productive area is lost to roads. In the analysis, the licensee applied a 6.9 percent volume reduction to future managed stands to account for future roads.

The licensee applied this volume reduction at time of harvest to future stands regenerating on all areas. As a result, the volume reduction was also applied to those stands with existing classified roads for which accounting was already done as described above. The licensee indicates that the application of the adjustment to stands with existing roads was intended to account for the site productivity losses from the construction of existing landings and trails.

District staff have reviewed the methodology and exclusions applied to account for site productivity lost to existing and future access structures. They state that the accounting for existing structures appears to have adequately addressed site productivity loss in current practice on the TFL. They note that the values used to derive the reductions were based on the licensee's recent performance, and included review of both aerial harvested and group selection harvested areas. Areas harvested using helicopter based systems typically have low site productivity losses, while areas harvested through group selection typically have very high losses due to the extensive access structure required.

I have reviewed the information regarding the accounting for roads, trails and landings. I accept the licensee's premise that the methodology provides accounting for existing trails and landings, and overall I am satisfied that existing structures have been adequately accounted for in the analysis.

While I acknowledge that productivity losses for the construction of future roads, trails and landings may decrease over time, I accept that these the best available information was used for this analysis.

- specific geographically defined areas

The Keystone Standard Basin Local Resource Use Plan (LRUP) was completed in May 1993 and applies to a portion of TFL 56. This LRUP contains recommendations for management in the Keystone Standard area, and describes a wilderness area that is recommended to be exempt from timber harvesting activities under the plan. The majority of the wilderness area lies outside the operable land base. In the analysis, an additional 1745 hectares were excluded in the derivation of the timber harvesting land base.

The Keystone Standard Basin LRUP has not been established as a higher level plan under the Forest Practices Code. In its management plan, the licensee for TFL 56 indicates that operational activities in the Keystone Standard Basin Area will be in compliance with the plan.

District staff indicate that the exclusion of this area in the analysis is consistent with current management, as timber harvesting is currently deferred in the area and no activities are planned. The majority of the area is currently within an MFRA, and falls within either primary or secondary caribou habitat.

I have reviewed the information regarding the area covered by the Keystone Standard Basin LRUP. I am aware that the plan was developed through a public process, and as such is a statement of public intent for the area. I am also aware that the current management regime for the area is consistent with the intent of the plan. However, I am mindful that the plan does not have any legal status under the Forest Practices Code.

In addition, I note that during the delineation of protected areas during the Kootenay-Boundary Land Use Plan (KBLUP) process, government did not designate the Keystone Standard Basin wilderness area as a protected area. In the future, this area may contribute to timber supply in a manner which is consistent with other objectives. I am satisfied that it is possible that future management for this area might include a level of timber harvesting consistent with the recreational resources in the area (including the historical trail discussed under *cultural heritage resources*), and acceptable to the users of the area.

As a result, I conclude that this area should be considered to contribute a modest amount to long-term timber supply for TFL 56. I will therefore take into account the timber supply impacts of including this area in the timber harvesting land base, and I will discuss my consideration of this further under 'Reasons for decision'.

I encourage BCFS and licensee staff work together to clarify the status of the area and define future management objectives, prior to the next determination for TFL 56.

- environmentally sensitive areas

Environmentally sensitive areas (ESAs) are identified during a forest inventory as areas that are sensitive to disturbance and/or are significantly valuable for fisheries, wildlife, water and recreation resources. ESA information is used to identify land to exclude from the timber harvesting land base where more specific or detailed information is not available about a particular forest resource. In the analysis for TFL 56, areas sensitive for regeneration, wildlife habitat and recreation were addressed through other means, as discussed in the relevant sections of this rationale.

1) soil stability

Terrain stability level D mapping has been completed for TFL 56. The licensee assumed that this mapping would provide the best available and most accurate information to assess soil stability. ESA data (Es1 – highly sensitive soils) was used to a limited extent in combination with this terrain stability data to identify areas for exclusion.

Licensee staff note that the total chance planning exercise used to delineate the operable land base excluded the majority of unstable areas.

In the derivation of the timber harvesting land base, the licensee excluded any areas identified by the terrain stability D level mapping as unstable (class V) that were also assigned a Es1 rating by the ESA data. Licensee staff then reviewed the remaining class V areas using information on harvesting and road building experience, terrain stability A assessment information, possibilities for alternative harvesting systems, and excluded those areas assessed to be unharvestable.

Following the procedures described above, a total of 49 percent of the class V areas delineated through the terrain stability level D mapping were excluded. None of the areas identified as potentially unstable (class IV) were excluded in the timber supply analysis. District staff have reviewed the methodology and the exclusions, and state that the reductions applied for unstable and sensitive soils on TFL 56 are consistent with operational practices on these areas.

Upon review of the information on the exclusions applied in the analysis to account for sensitive and unstable soils, I am satisfied that the methodology used has provided adequate accounting.

2) avalanche hazard

Avalanche hazard is also a consideration for operations on TFL 56. The licensee did not use ESA data to assess avalanche hazard, as better information was available. The licensee recently acquired avalanche likelihood mapping for the TFL, that provides information on the likelihood of an avalanche occurring on any given area should the forest cover be removed. Based on discussions with the consultant who prepared the mapping, the licensee assumes that the use of group selection harvesting systems to limit down-slope exposure distances should eliminate the need to exclude areas from harvest. As a result, in the analysis the licensee assigned those high risk polygons—where greater than 50 percent of the area was assigned a high or very high likelihood of avalanche in the mapping—to an analysis unit with group selection harvesting systems. District staff have reviewed the assumptions, and indicate that they are reflective of current management to mitigate avalanche hazard. Recent forest practices in avalanche areas includes the retention of narrow leave strips along avalanche tracks, the retention of tall stumps and in-block reserves to reduce risks, and the use of group selection silvicultural systems.

I commend the licensee for its work to obtain avalanche likelihood mapping for the TFL. Having reviewed the information provided, I am satisfied that the assumptions regarding the harvesting of areas at high risk of avalanche reflect current practice. I accept the information as modelled in the analysis, and make no adjustments in this regard.

- sites with low timber growing potential

In order to determine the timber harvesting land base, sites with low productivity as a result of inherent site factors such as nutrient availability, exposure, excessive moisture, or that are not fully occupied by commercial tree species are removed from the productive forest land base.

In the timber supply analysis, the licensee used site index (measured in metres in height at age 50) information from the inventory file to delineate and exclude sites with low timber growing potential. Separate thresholds were applied to stands scheduled for aerial harvest as opposed to those stands scheduled for non-aerial harvest. All stands with site indices of 8 metres or less in areas operable for helicopter-harvesting, and all stands with site indices of 7 metres or less in conventionally operable areas, were excluded in the derivation of the timber harvesting land base. A total of just under 300 hectares were excluded on this account. Licensee staff have reviewed the excluded areas, and believe that these site index thresholds are realistic. Licensee staff note that TFL 56 generally has very good growing conditions and contains few sites with low timber growing potential.

The chief forester requested in his previous determination for TFL 56 that actual performance in low productivity areas be reviewed, and that the next timber supply analysis reflect the findings of such a review. District staff indicated that the licensee did conduct an analysis of the concern during the preparation of information for the timber supply analysis. Staff accept the criteria and deductions used in the analysis, and believe they adequately represent sites not suitable for timber production on TLF 56.

I have reviewed the criteria used, and discussed the information with district staff. I accept that the exclusions applied in the analysis adequately account for these sites on TFL 56.

- problem forest types

Problem forest types are typically defined as stands which are physically operable and exceed low site criteria and yet are not currently utilized or have marginal merchantability. These types are either wholly or partially excluded from the timber harvesting land base for the analysis.

At the time of the previous determination for TFL 56 there was uncertainty as to whether too many problem forest types had been included in the timber harvesting land base.

The licensee, in Management Plan No. 2, included a commitment to harvest 62 hectares each year in these stand types, defined at the time as age class 8 and 9 predominantly hemlock stands. The licensee reviewed its harvesting performance in the problem forest types in the preparation of Management Plan No. 3, and demonstrates that performance has exceeded this commitment. The licensee harvested an average of over 90 hectares annually from these types during the past five year period.

The licensee notes that current practice now includes harvest of virtually the entire profile of stands on the timber harvesting land base. As a result, it made only minor problem forest type deductions in the 1999 analysis. All stands with a stocking class of 2 or greater, and all stands over 120 years of age and less than 19.5 metres in height were

excluded in the derivation of the timber harvesting land base. A total of 3420 hectares were identified which met these criteria. District staff have reviewed the criteria used and state that they provide a reasonable reflection of criteria guiding current operations on the TFL.

In addition, the licensee excluded 1387 hectares of deciduous-leading stands, and excluded all deciduous volume in coniferous leading stands from the volume estimates. District staff confirm that deciduous species are not utilized in current practice on TFL 56.

Having reviewed the information regarding problem forest types, I am satisfied that there was an adequate accounting for problem forest types in the analysis. I accept that the best available information was used, and make no adjustments on account of this factor.

Existing forest inventory

The inventory data used for the timber supply analysis were collected during a forest inventory completed in 1989. For the analysis, the inventory file was updated to January 1999 to account for growth, disturbances such as harvesting and fire, and for silvicultural treatments.

At the time of the previous determination, it was noted that the inventory data used for TFL 56 was collected prior to the subdivision of the much larger TFL 23 area, and many of the original inventory plots were outside the smaller unit's boundaries. Given the associated uncertainty regarding the inventory data, the chief forester in his 1996 determination requested that a comprehensive inventory specific to the TFL land base be completed for use in the preparation of Management Plan No. 3.

In 1999, BCFS Resources Inventory Branch completed an audit of the 1989 inventory for TFL 56, which reviewed:

- the mature component of the inventory, assessing differences between the existing inventory's estimate of mean mature volume per hectare for the TFL and a new estimate obtained from the audit samples;
- the immature component, testing site index assignment; and
- the non-forest component, testing the accuracy of the non-forest classification.

The audit results indicate the mature component of the inventory is statistically acceptable. As a result, the licensee requested relief from the requirement to complete an inventory for Management Plan No. 3. The chief forester granted this request, but asked that the licensee undertake a thorough assessment of the inventory in conjunction with regional and provincial inventory staff. He also requested that the licensee include an action plan as part of its management plan that prioritizes and resolves any outstanding concerns with the inventory. These requirements are to be met over the term of Management Plan No. 3.

The licensee has planned to undertake vegetation resources inventory (VRI) mapping to BCFS standards in conjunction with a coordinated project for the district. However, due to funding considerations a project has not yet been initiated in the Columbia Forest

District. The licensee commits in Management Plan No. 3 to complete phase one of the VRI inventory over the term of the management plan.

I have discussed the results of the audit under *volume estimates for existing stands* and *non-productive and non-forested reductions.*

I have considered the information regarding the current forest inventory used in the timber supply analysis, and am satisfied that—subject to the discussion in this rationale—it forms an acceptable basis for this determination. I therefore accept it as the best available information, and suitable for use in this determination.

- age-class structure

Age-class structure data from the inventory file is used in the analysis to project forest stand conditions over time. The assumptions about age classes can impact timber supply at any point in the analysis horizon since they form the basis against which minimum harvestable ages, green-up requirements and other forest cover constraints are applied.

District staff note that the age class structure in the Goldstream and Downie drainages on TFL 56 is not depicted accurately in the inventory file. Due to a suspected classification error, stands of the same age in the two drainages are described as age class 8 in one drainage and age class 9 in the other. However, BCFS staff indicate that this discrepancy does not affect the timber supply analysis, as both age classes are above minimum harvestable age, and are considered of sufficient age to meet the biodiversity constraints in the analysis.

I have reviewed the information regarding age class structure, and accept that there are no issues for this determination.

- species profile/harvest profile

Most stands on TFL 56 are either western redcedar- or hemlock-leading, which together account for 68 percent of stands on the timber harvesting land base. A further 25 percent of stands are dominated by spruce. The remainder of stands are predominantly Douglas-fir or balsam species.

District staff have reviewed the species information from the analysis, and indicate that it is representative of species currently present on TFL 56. I accept that this information appropriately reflects current conditions for this determination.

- volume estimates for existing stands

Existing natural stand volumes were estimated and projected using forest inventory attributes and the Variable Density Yield Prediction (VDYP) model, which was developed by the BCFS Resources Inventory Branch. The volumes for existing natural stands in which species and stocking have not been managed—defined as those stands older than 20 years of age—were projected using this model. Once a stand was harvested for the first time in the analysis, the licensee projected its future growth and yield using estimates from the managed stand yield tables. As discussed under *problem forest types*, the licensee excluded all volumes from the deciduous species component of existing natural stands from the yield estimates.

VDYP was also used to project volumes for existing natural stands harvested through group selection. In the base case modelling, the majority of these group selection stands were harvested in one hectare patches. For two blocks subject to group selection that were not divided into one hectare patches, the licensee used complex stand yield curves in which one third of the initial volume was removed in a series of three harvest passes spaced at 35- or 50-year return intervals. Following the third harvest, all original stand volume was assumed removed, and future volumes were projected using managed stand yield curves as discussed under that section.

The existing stand yield tables were reviewed and accepted by the BCFS Resources Inventory Branch in June 2000 as appropriate for use in the analysis.

As mentioned under 'Existing forest inventory', Resources Inventory Branch conducted an audit on the mature component of the forest inventory. The audit assessed differences between the existing inventory's estimate of mean mature volume per hectare for the TFL and a new estimate obtained from the audit samples, and found no statistically significant differences. The results of this audit suggest that the volumes projected for existing natural stands using the inventory data are reliable.

District staff indicate that they have no specific concerns about the volumes estimated for existing stands on the TFL.

I have reviewed the information regarding the volume estimates for existing stands. I am satisfied that acceptable procedures were followed in the analysis, and that the projected yields reflect current stand conditions on TFL 56. I therefore accept the information as suitable for use in this determination.

Expected rate of growth

- site productivity estimates

Inventory data includes estimates of site productivity for each forest stand, expressed in terms of a site index. The site index is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow. This in turn affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced, and the ages at which a stand will satisfy mature forest cover requirements and reach a merchantable size.

In general, in British Columbia, site indices determined from younger stands (i.e. less than 30 years old), and older stands (i.e. over 140 years old) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been subject to management of stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This has been verified in several areas of the province where studies—such as the old-growth site index (OGSI) project—suggest that actual site indices may be higher than those indicated by existing provincial inventory data from old growth forests. Studies include those known as 'paired-plot'—where plot samples from an old-growth stand and the adjacent second growth stand are compared—and a provincial veteran tree study. It

has been consistently concluded from such studies that site productivity has generally been underestimated; managed forest stands tend to grow faster than projected by inventory-based site index estimates from old-growth stands.

Given the lack of local site productivity data on old growth stands, the licensee did not apply any OGSI adjustments in the base case of the analysis. Instead, the adjustments were applied in sensitivity analyses to stands currently older than 140 years of age after they were harvested in the modelling. Research Branch staff reviewed the proposed adjustments and determined that they were suitable for use in sensitivity analysis.

In the first sensitivity analysis, stand volumes were adjusted using data from both the paired plot and veteran tree studies. In the results, the long-term harvest level increased by 15 percent above the long-term level projected in the base case. In the second sensitivity analysis the volume curves were adjusted in the same manner, and minimum harvestable ages were also adjusted to reflect the increased site productivity. In this sensitivity analysis, the long-term harvest level increased by 18 percent.

I note that the sensitivity analysis results indicate that mid- to long-term timber supply could significantly increase if the appropriate site productivity adjustments for TFL 56 were in the range indicated by the OGSI studies.

The inventory audit conducted on TFL 56 indicated that due to inventory inaccuracies, the site indices on the inventory file for immature stands (i.e., those less than 60 years of age) may not be accurate. The old-growth site index value is frequently retained in the inventory for the stand following harvest. The licensee has begun a long-term project of obtaining better site index estimates for second growth stands, using the growth intercept method and data collected during free-growing surveys. To date, the licensee has surveyed and re-assigned site indices for approximately 934 hectares. The improved site index estimates for the surveyed stands were incorporated into the base case assumptions.

The average site index adjustment applied to the immature stands surveyed to date represents a 36 percent increase above the average site index originally provided for those stands in the forest inventory file. The licensee indicates that site index adjustments using this method could apply to an additional 6521 hectares of previously harvested stands that remain to be surveyed.

I have reviewed the information regarding site productivity on TFL 56. While the exact productivity is not certain, based on data accumulated through such projects as the OGSI study, I expect that most second-growth stands will grow more quickly than suggested by productivity estimates from old-growth stands. The sensitivity analysis results provide me with an assessment of the timber supply impacts that may result if the adjustments are in the range suggested by the OGSI studies.

In conclusion, I am satisfied that the site productivity of sites currently occupied by old growth stands on TFL 56 is underestimated, and that the mid- and long-term harvest levels could be somewhat higher than presented in the base case. I will account for this under 'Reasons for decision'.

With respect to the site indices for the immature stands on the TFL, I encourage licensee staff to continue to collect data and compare the site productivity estimates from the

inventory database with the site productivity values determined in the field. Better information will become available over time that can be incorporated into future timber supply analyses.

- volume estimates for managed stands

In the analysis, the licensee used the Table Interpolation Program for Stand Yields (TIPSY) growth and yield model to estimate volumes for managed stands. Managed stands for TFL 56 were defined as all existing stands 20 years of age or less, and all stands regenerated in the future.

As discussed under *not-satisfactorily-restocked areas*, the licensee has now converted approximately 217 hectares of previously backlog NSR area to stands with low stocking. These sites have stocking of between 300 and 700 well spaced stems per hectare, and were included in the timber harvesting land base in the analysis. The licensee generated separate yield tables to account for the lower stocking and subsequently lower yields on the sites.

Approximately 4180 hectares on TFL 56 were assumed to be harvested using group selection silvicultural systems, as discussed under *silvicultural systems*. The majority of the stands were divided into one hectare patches, and the initial stand volumes projected using VDYP until the first harvest of each patch. Following harvest, the licensee used TIPSY curves to project the stand volumes.

Two blocks assumed harvested through group selection were not divided into one hectare patches. The licensee generated separate yield tables for these stands, and initial volumes were projected using VDYP as discussed under *volume estimates for existing stands*. Following the removal of all existing stand volume (i.e., after the third harvest entry), the yields were projected using managed stand yield curves. Harvest entries removing one third of the volume at a time were scheduled at intervals for the remainder of the analysis horizon.

The licensee applied a 5 percent volume reduction to the managed stand yield curves for the stands harvested through group selection, to reflect the lower volumes expected as a result of increased shading and edge effects.

The managed stand assumptions and yield tables were reviewed and accepted by Research Branch and Timber Supply Branch staff for use in the analysis.

I have reviewed the information regarding the assumptions for managed stands in the analysis. I am satisfied that the volume estimates were reasonably projected, and that the estimates are suitable for use in this determination.

In addition, I commend the licensee for its effort to more reasonably estimate in the analysis the expected yields from stands with low stocking.

- operational adjustment factors

TIPSY projections are initially based on ideal conditions, assuming full site occupancy and the absence of pests, diseases and significant brush competition in the stand. Certain operational conditions, such as less than ideal tree distribution, small non-productive

areas, endemic pests and diseases, or age dependent factors such as decay, waste and breakage may cause yields to be reduced over time. Operational adjustment factors (OAFs) are applied to yields generated using TIPSY to account for losses of timber volume as a result of these operational conditions. OAF 1 can account for factors affecting the yield curve across all ages, such as small stand openings. OAF 2 can account for factors such as pests, disease, decay, waste and breakage whose impacts tend to increase over time, and whose influence on a stand may often be reduced through management practices.

In the analysis, the licensee applied the standard provincial reductions of 15 percent for OAF 1 (accounting for less than ideal tree distribution, small non-productive areas, endemic pests and disease, and random risk factors such as windthrow), and 5 percent for OAF 2 (accounting for decay, waste and breakage) to all areas.

As described under *volume estimates for managed stands*, the licensee applied an additional volume reduction of 5 percent to replacement stands where group selection silvicultural systems were assumed to be prescribed.

Armillaria ostoyae (armillaria) is a root disease which affects a component of most managed and natural forest stands in the southern third of British Columbia. District staff note that armillaria is likely present in the stands on TFL 56. The Nelson Forest Regional pathologist indicates that stands on mid to low elevation slopes are susceptible to damage from root disease. However, no specific information is available about the occurrence of this root disease on TFL 56. As a result, the licensee did not incorporate an additional adjustment to account for the impacts of root disease, beyond the impacts accounted for in the standard provincial values.

I note that armillaria is expected to affect the vigour, stocking levels and species composition of second-growth stands, although limited information is available on the timber supply impacts of the disease. Ongoing research in the province, including some studies in the Nelson Forest Region, also indicates that the root disease results in yield reductions in managed stands beyond what is accounted for in the standard OAF reductions.

Given the lack of information regarding the extent and severity of the occurrence of armillaria on TFL 56, I cannot assess if additional reductions above the standards OAFs applied to the yield projections are warranted.

For this determination, I accept the standard provincial OAFs as modelled in the base case to represent the best available information. However, in acknowledgement of the potential risks to timber supply if these OAFs in fact underestimate the impacts of armillaria, I encourage the collection of data to enable further refinement of OAFs before the next analysis.

- minimum harvestable ages

A minimum harvestable age is an estimate of the earliest age at which a forest stand has reached a harvestable condition (i.e., has met minimum merchantability criteria). The minimum harvestable age assumption largely affects when second growth stands will be available for harvest. In practice, many forest stands may be harvested at older ages than

the minimum harvestable age, due to economic considerations and constraints on harvesting which arise from managing for other forest values such as visual quality, wildlife habitat and water quality.

To determine minimum harvestable ages for stands on TFL 56, the licensee evaluated the ages at which modelled stands met certain minimum criteria. The licensee determined the age at which a stand achieved each of the following criteria: a stand volume of at least 150 cubic metres per hectare, and an average stem diameter of 25 centimetres at breast height. In addition, the stand had to be at least 80 years of age and under the age at which the mean annual increment (MAI) was maximized. The licensee used professional judgment to select the minimum harvestable age for each stand, within the range of ages resulting from the application of this minimum merchantability criteria. Some flexibility was allowed for stands on lower sites where the age at which MAI is maximized is below the age at which the minimum diameter would be achieved.

District staff have reviewed the criteria and methodology used by the licensee, and indicate that the derived ages seem reasonable.

The licensee also prepared sensitivity analysis to assess the timber supply impacts of adjusting the minimum harvestable ages. The results indicate that if the ages were 10 years greater than assumed, the base case initial harvest level could be maintained for only one decade before declining. If the ages were decreased by 10 years, the initial harvest level could be maintained for an additional three decades before declining. These results illustrate that short-term harvest levels are sensitive to the age at which managed stands become available for harvest, as managed stand volumes begin to contribute significantly to timber supply in the sixth decade of the analysis horizon.

I have reviewed the information regarding minimum harvestable ages, and note that it is always difficult to precisely determine the ages at which managed stands will become available for harvest in the future.

Noting the sensitivity analysis results which indicate that timber supply in this unit is highly sensitive to the assumptions for minimum harvestable ages, I encourage the licensee to review the criteria and methodology to obtain the best possible estimate for future analyses.

For this determination, I accept the minimum harvestable ages assumed in the analysis, and make no adjustments.

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

Expected time for the forest to be re-established following harvest

- regeneration delay

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. In timber supply analysis, regeneration delay is used to determine the starting point of tree growth for the yield curves that project stand volumes over time.

In the timber supply analysis, the licensee assumed that all sites would regenerate through planting. Based on a review of operational records from the Major Licensee Silviculture Information System (MLSIS), the licensee assumed a regeneration delay of 2 years.

District staff state that the assumptions regarding regeneration and regeneration delay are reflective of current practice on TFL 56.

I have reviewed the information regarding regeneration delays. Based on the discussions with district staff, I accept that the analysis assumptions reflect the best available information and that they are suitable for use in this determination.

- impediments to prompt regeneration

Regenerating stands may be influenced by factors that impede regeneration and reduce early stand growth. These factors should be accounted for when projecting stand yields over time.

No impediments to regeneration have been identified for TFL 56. The licensee notes that some areas are identified through ESA data as sensitive for harvesting as a result of regeneration concerns (Ep). However, licensee staff state that they have harvested in these stand types and have not experienced difficulties regenerating these areas, largely as a result of employing alternative silvicultural systems (i.e., group selection and single tree selection), and through selection of appropriate species mixes for regeneration. Therefore, in the analysis these areas were retained in the timber harvesting land base and assumed to be harvested using group selection silvicultural systems, as discussed under that section of this rationale. As well, the regeneration assumptions did not incorporate any accounting for regeneration difficulties on these areas.

District staff confirm that the licensee manages its regeneration program effectively, and there are no significant impediments to regeneration on TFL 56.

Having reviewed the information, I am satisfied that this factor was appropriately accounted for in the timber supply analysis.

- not-satisfactorily-restocked areas

Not-satisfactorily-restocked (NSR) areas are those areas where timber has been removed, either by harvesting or by natural causes, and a stand of suitable tree species and stocking has yet to be established. Where a suitable stand has not been regenerated and the site was harvested prior to 1987, the classification is 'backlog' NSR. All other NSR is considered 'current' NSR.

The licensee restocks all current NSR within regeneration delay time limits, and this was reflected in the timber supply analysis. The licensee has pursued an aggressive reforestation program for backlog NSR over the past few years. The licensee indicates in its management plan that all backlog areas have been brought up to standard stocking or have been accepted at lower stocking levels because there are no practical treatments to lead to full stocking. No remaining areas are now classified as backlog NSR on the TFL.

In the analysis, the licensee excluded approximately 224 hectares with insufficient stocking of coniferous species from the timber harvesting land base, under *non-productive and non-forested reductions*. An additional 217 hectares with low levels of coniferous stocking (between 300 and 700 stems per hectare) were modelled with reduced yields, as discussed under *volume estimates for managed stands*.

District staff confirm that the analysis assumptions appropriately reflect the status of current and backlog NSR areas on TFL 56.

I have reviewed the information regarding not-satisfactorily-restocked areas, and am satisfied that the reforestation of NSR areas on TFL 56 has been appropriately reflected in the analysis, and make no adjustments.

(iii) silviculture treatments to be applied to the area,

Silvicultural treatments to be applied

- silvicultural systems

Most harvesting on TFL 56 has occurred through the use of the clearcutting silvicultural system (i.e., removal of all of the stand volume associated with the area harvested). The licensee practices group selection silvicultural systems on some portions of TFL 56 to meet specific management objectives. The use of these two silvicultural systems, in the proportions applied in current practice, was assumed in the analysis.

In the analysis, it was assumed that group selection would be practised on areas with one or more of the following characteristics: high or very high likelihood of avalanche; difficult to regenerate (i.e., with the Ep designation), and in the vicinity of Lookout Mountain. A total of 4180 hectares was assumed to be harvested through group selection.

To approximate operational practice, the majority of the stands subject to group selection in the analysis were assumed to be harvested in one-hectare patches. Stand volumes were projected as discussed under *volume estimates for existing stands*, and *volume estimates for managed stands*. The yield assumptions for two blocks not divided into one-hectare patches are also discussed under those sections.

The return interval for group selection harvest assumed in the analysis was either 35 or 50 years, depending on the location of the stands. MELP staff question the return interval assumptions, noting that the projected harvest interval may be shorter than will be realized in operational practice due to considerations for caribou habitat. However, in the analysis caribou habitat requirements were assumed to be met through the mature forest retention areas (MFRAs), as discussed under Integrated Resource Management. In any event, review of the analysis results indicates that changes in this assumption do not affect short- or mid-term timber supply.

District staff confirm that the licensee employs group selection on the types of areas assumed in the analysis. They indicate that the analysis assumptions regarding silvicultural systems are reasonably consistent with current practice on TFL 56.

I have considered the information regarding silvicultural systems. I am satisfied that the analysis assumptions reasonably reflect current practice, and accept the licensee's efforts to reflect operational practices on the timber harvesting land base. Any small uncertainties around the assumptions for the return interval on some of the areas harvested through group selection can be clarified as this silvicultural system continues to be practised on the TFL. I accept the information as appropriate for this determination.

- use of select seed

The Forest Practices Code requires the use of the best genetic quality seed and vegetative material source available for regeneration. Select seed produced from seed orchards is the product of B.C.'s forest gene resource management program, which uses traditional tree breeding techniques to select naturally-occurring, well-adapted, healthy and vigorous trees.

No gains from select seed were modelled in the analysis. Select interior spruce seed with an average genetic worth of 10 percent has comprised approximately 16 percent of all stock planted over the past five years on TFL 56. Select interior spruce seed with an average genetic worth of 14 percent is projected to comprise approximately 25 percent of all stock planted over the next two years.

The timber supply impacts resulting from the use of select seed were not specifically tested in a sensitivity analysis. However, the sensitivity analysis in which managed stand yields were increased and decreased gives an indication of the relationship between changes in these yields and overall timber supply. When managed stand yields were increased by 10 percent, long-term timber supply correspondingly increased by 10 percent.

BCFS staff reviewed the impact of select seed use on managed stand yields, and found that the current level of use results in a one percent managed stand yield increase. These results indicate that long-term timber supply might be underestimated by one percent on this account.

I have reviewed the information regarding the use of select seed, and I expect that this level of use will continue. I am therefore satisfied it is appropriate to take into account the current level of use on TFL 56. I conclude that long-term timber supply is underestimated by 1 percent, and my considerations of this are discussed further under 'Reasons for decision'.

- incremental silviculture

Incremental silviculture includes activities such as commercial thinning, juvenile spacing, pruning and fertilization that are beyond the silviculture activities required to establish a free-growing forest stand.

No specific incremental silvicultural activities were assumed in the analysis, as none are practiced to any great extent on the TFL at present. The licensee commits in Management Plan No. 3 to develop a strategic silvicultural plan which will focus on the definition of wood quality objectives and specific strategies to achieve those objectives.

District staff confirm that the analysis assumptions regarding incremental silviculture reflect current practice.

I have reviewed the information regarding incremental silviculture, and accept that the assumptions regarding these activities were appropriate. Any changes over time in operational practices in this regard can be factored into a future analysis.

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

Timber harvesting

- utilization standards and compliance

Utilization standards define the species, dimensions and quality of trees that must be harvested and removed from an area during harvesting operations. In the timber supply analysis, the utilization standards assumed for most species were a minimum 17.5-centimetre diameter at breast height (dbh) with a 30-centimetre maximum stump height and 10-centimetre minimum top diameter inside bark. The licensee used two variations from this standard. For lodgepole pine stands, the minimum dbh standard used was 12.5 centimetres. For western redcedar stands greater than 140 years of age, a 15-centimetre minimum top diameter inside bark was used.

District staff confirm that these standards reflect those applied in current operations. Staff also indicate that the district manager relaxes the standards to allow a stump height of up to 1.5 metres to facilitate winter harvesting operations. However, staff note that where this standard is applied, the additional unutilized volume is accounted for in waste surveys. Further, staff indicate that stump heights are rarely as high as 1.5 metres.

I have reviewed the information regarding utilization standards. I am satisfied that there are no timber supply implications resulting from the higher stump heights, given that this volume is accounted for appropriately during waste surveys. I conclude that utilization standards were appropriately reflected in the timber supply analysis, and make no adjustments.

- decay, waste and breakage

For managed stand yield curves, as previously discussed (see *volume estimates for managed stands*), the TIPSY model incorporates OAFs that account for anticipated decay, waste and breakage.

For existing stand yield curves, the VDYP model that is used to project volume incorporates estimates of volume of wood lost to decay, waste and breakage. Decay losses are built into the volume estimates, while standard waste and breakage factors are incorporated into the analysis when developing VDYP yield curves. These estimates of losses have been developed for different areas of the province based on field samples.

The licensee used standard procedures to develop the decay, waste and breakage factors applied in the analysis for TFL 56.

Upon review of the information, I am satisfied that acceptable procedures were used in the development of the factors, and that it represents the best available information for the TFL.

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production,

Integrated resource management objectives

The Ministry of Forests is required under the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply must be considered in AAC determinations.

To manage for resources such as water quality and aesthetics, current harvesting practices limit the size and shape of cutblocks and maximum disturbances (areas covered by stands of less than a specified height), and typically prescribe minimum green-up heights required for regeneration on harvested areas before adjacent areas may be harvested. Green-up requirements provide for a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape.

The licensee for TFL 56 recently completed a landscape level plan, entitled *Revelstoke Community Forest Corporation 1999 Caribou, Biodiversity, and Ungulate Analysis*. This plan has been reviewed and accepted by BCFS and MELP staff as an acceptable management approach for the TFL until landscape unit planning is finalized. The licensee uses the landscape level plan as a guide for operational practice, and the plan's approach was modelled in the timber supply analysis. The landscape level plan is consistent with the recommendations arising from the RMAC strategy.

In Management Plan No. 3, the licensee for TFL 56 commits to adhere to the principles of the RMAC plan. The timber supply analysis was consistent with these principles. In the analysis, several overlapping management zones were created to reflect the various constraints on the land base for caribou habitat, recreation and other resource values. These constraints are discussed in the following sections.

- mature forest retention areas

The licensee's landscape level plan addresses the forest cover requirements for wildlife and biodiversity through the establishment of 'Mature Forest Retention Areas' (MFRAs). In delineating the MFRAs, the licensee targetted areas of mature forest that would contribute to meeting forest cover requirements while also addressing connectivity considerations. In the timber supply modelling, the MFRAs were spatially explicit and assumed to be permanent, although operationally the licensee indicates that the location of the reserves can be adjusted if appropriate.

To minimize the impact of the MFRAs on the timber harvesting land base, licensee staff also reviewed the forested areas excluded for other reasons in the derivation of the timber

harvesting land base—such as riparian reserves and low sites—and included those areas they deemed to be suitable in the MFRAs. A total of 9226 hectares were excluded for MFRAs in the derivation of the timber harvesting land base.

The licensee used sensitivity analysis to assess the implications of applying forest cover constraints instead of MFRAs to address requirements for wildlife and biodiversity. The results showed that the initial harvest level could be maintained for a decade longer than in the base case, and that the long-term harvest level could increase to 89 100 cubic metres per year compared to the base case level of 74 100 cubic metres per year.

A review of the results to assess the cause of the difference showed that about 1800 hectares in excess of the estimated area needed were reserved as MFRAs in the base case to meet biodiversity and wildlife requirements.

However, licensee staff note that some MFRA area that was added back into the timber harvesting land base for this sensitivity analysis is fragmented or otherwise unsuitable for harvesting. As a result, licensee staff suspect that available timber supply likely falls somewhere between the base case harvest projection and the second sensitivity analysis results discussed above. They do state, however, that the use of spatially explicit MFRAs, rather than simple modelling of percent forest cover requirements, likely provides a more realistic assessment of available timber supply.

Having reviewed the information about the use of the MFRAs in the analysis, I accept that the approach provides a reasonable approximation of the requirements for habitat and biodiversity guiding current operational practice. Although these areas were assumed to remain static for the purposes of the timber supply analysis, I am aware that the intent operationally is allow for some movement of the areas should it be appropriate. However, I am satisfied that there are no implications for this determination as a result of the slight variation between what was modelled and operational practices regarding the area location.

I expect that it will become easier to model the approach taken on TFL 56 as operations under the management regime continue, and I look forward to any refinements in the information for the next analysis.

I am also satisfied that the approach taken in the analysis to provide for landscape level biodiversity and wildlife values, while not a typical approach, is not inconsistent with the intent under provincial policy.

However, I accept that in the analysis, the amount of area required in MFRAs was overestimated by an unknown amount, and that as a result timber supply has been underestimated in the base case. I will discuss my considerations of this further under 'Reasons for decision'.

- cutblock adjacency

Objectives for forest cover and cutblock adjacency guide harvesting practices in order to address resource values such as wildlife habitat and visual quality. Adjacency objectives address the minimum green-up height required before an adjacent area may be harvested, and the maximum area permitted to be covered with stands less than the minimum green-up height.

For this analysis, the licensee assumed that the patch size objectives described in the *Landscape Unit Planning Guide* would replace the adjacency objectives normally applied. Although the Guide does not include managing for patch size as a priority objective, this form of cutblock location is generally considered to better reflect natural processes and address the needs of wildlife. In the base case, the licensee applied modelling methods aimed at attaining the desired patch size distributions in each landscape unit. While the resulting distributions did not precisely meet the objectives described in the Guide, district and MELP staff agree that the results are satisfactory, considering that they are influenced by the current distribution of forest cover.

The forest cover constraints applied to address low and intermediate biodiversity, moose winter range, deer winter range, caribou habitat, and visual quality are discussed in subsequent sections in this rationale.

I have reviewed the information regarding patch size and cutblock adjacency, and accept that the analysis assumptions provided a reasonable reflection of current practices.

- recreation features

The area of TFL 56 is used for a variety of recreational pursuits, including fishing, hunting, snowmobiling, heli-hiking and heli-skiing. The licensee notes that recreation use has increased in recent years.

No areas on TFL 56 were identified by the ESA data as sensitive due to recreation (Er) concerns. For the analysis, the licensee reviewed 1992 Recreation Features Inventory and Recreation Opportunity Spectrum mapping completed by the previous tenure holder, but no specific areas were identified in the mapping that were required to be excluded to address recreation concerns. The licensee has recently updated this mapping and submitted it for approval.

The Keystone Standard Basin area includes a wilderness area and hiking trail, but the entire area was excluded in the derivation of the timber harvesting land base as discussed under *specific geographically defined areas* and *cultural heritage resources*.

The licensee commits in Management Plan No. 3 to work with recreation users to enhance recreation opportunities on the TFL. District staff confirm that the licensee has appropriately met its commitments in this regard in the past, and that recreation use on TFL 56 does not significantly constrain harvesting operations.

I have reviewed the information regarding recreation on TFL 56. I am satisfied that these resource values were appropriately considered in the analysis, and make no adjustments on this account.

- visually sensitive areas

The licensee had committed in its previous management plan to undertake a landscape inventory for the TFL. However, the Revelstoke MAC strategy and recommendations have since been completed, and no scenic areas were recommended for the area of TFL 56. As a result, the licensee did not complete the landscape inventory.

Recommended visual quality objectives of partial retention exist for one small portion of the Keystone Standard Basin Local Resource Use Plan area. This area falls within a caribou recruitment zone (see discussion under *caribou habitat*) and is also partially

encompassed by an MFRA. As a result, the licensee determined that the partial retention visual objectives would easily be met in this area through the other constraints applied in the analysis, and did not apply any specific VQO constraints. District staff confirm that the analysis assumption for this area approximates current practice. Operationally, harvesting in the area not within the MFRA complies with recruitment caribou objectives, which also meet the requirements for partial retention.

The licensee notes in Management Plan No. 3 that it engineers new harvesting areas with basic visual principles such as shape and configuration of cutblocks in mind.

Having reviewed the information regarding visually sensitive areas, I am satisfied that the analysis assumptions were appropriate, and make no adjustments in this regard.

- water quality

There are no domestic or community watersheds on TFL 56. Several domestic and commercial water use licences are held on the TFL. The licensee maintains a listing of water licences and commits in its management plan to consider the needs of these users during planning and operations on the TFL.

No specific requirements were modelled in the timber supply analysis. District staff confirm that, although management considerations for water quality are considered in operational plan approvals, they are not expected to affect timber supply on TFL 56.

I have reviewed the information regarding water quality, and accept that the analysis assumptions were appropriate and are acceptable for use in this determination.

- cultural heritage resources

Cultural heritage resources include archaeological and traditional use sites. Archaeological sites contain physical evidence of past human activity, whereas traditional use sites may not necessarily contain physical evidence of historical use but may be used currently by a First Nation. To help manage for unrecorded archaeological sites, archaeological overview mapping may be conducted to assign high, moderate or low ratings for archaeological potential within an area.

No archaeological overview mapping has been conducted on the area of TFL 56. Sites with high likelihood of archaeological potential are identified in conjunction with local First Nations representatives at the forest development planning stage. Where required by the district manager, archaeological impact assessments are conducted to locate potential sites. However, the licensee indicates that no sites have been found on the TFL to date. The licensee commits in Management Plan No. 3 to continued work with First Nations to identify possible sites.

The historical Keystone Standard Basin trail is located on TFL 56. Management provisions for this trail are described by the Keystone Standard Basin LRUP. As described under *specific geographically defined areas,* land base exclusions were applied in the analysis to account for the wilderness area delineated under this plan, and the majority of the trail is located in the inoperable portion of the wilderness area.

A small portion of the trail exists outside the area recommended for protection under the provisions of the LRUP. However, the licensee indicates that the trail falls within an area

in which no harvest is planned due to other constraints, and therefore no additional reductions are required in the analysis. District staff concur with this assessment.

I have reviewed the information regarding cultural heritage resources, and I am satisfied that the analysis has appropriately reflected the current operational requirements for these resources. As discussed under *specific geographically excluded areas*, I am taking into account in this determination that portions of the Keystone Standard Basin area may in the future contribute to timber supply in some manner. However, I note that consideration of cultural heritage resources occurs at the operational level in an appropriate manner. As additional information becomes available it can be reflected in a future timber supply analysis.

- riparian habitat

Riparian habitats occur along streams and around lakes and wetlands. The Forest Practices Code requires the establishment of riparian reserve zones (RRZs) that exclude timber harvesting, and riparian management zones (RMZs) that restrict timber harvesting in order to protect riparian and aquatic habitats. For each stream, lake or wetland, the RRZ and RMZ make up the entire riparian management area. Stream classes are described in the *Riparian Management Area Guidebook* and are determined based on presence of fish, occurrence in a community watershed and average channel width criteria. The stream class is used to estimate the area required to be retained in the RRZ and the area or volume to be retained in the RMZ. Similar criteria are used to classify lakes and wetlands and estimate reserve zone and management zone retention.

Lake, wetland and stream classification mapping for the TFL was completed in 1998 and this mapping was used in the analysis. The licensee approximated classifications for any remaining unclassified streams using professional judgment. To calculate area exclusions, streams were spatially buffered for RRZs and RMZs based on stream class. The licensee entirely excluded the area of reserve zones in the analysis; for management zones, the licensee estimated the percentage of volume removal based on stream class and deducted an equivalent area.

TFL 56 also contains lakes and wetlands, which the licensee manages in accordance with the Forest Practices Code provisions. The licensee estimated and excluded area to account for reserve and management zones on lakes and wetlands in the same manner as for streams.

In total, 1050 hectares were excluded in the derivation of the timber harvesting land base to account for management practices in RRZs and RMZs.

District staff have reviewed the criteria and deductions applied, and indicate that the assumptions regarding reserve and management zone widths, as well as the assumptions around the management in these areas, were reflective of current practice.

Having reviewed the information on riparian habitat, I accept that the best available information was used, and that current practice was appropriately reflected in the timber supply analysis.

- wildlife habitat

TFL 56 provides habitat for a number of wildlife species, including grizzly bear, black bear, deer, mountain caribou, mountain goat, small mammals such as fisher and marten, and numerous bird and fish species.

The Conservation Data Centre of BC maintains forest district tracking lists, which name those species and plant associations considered to be at risk (e.g., endangered, threatened, vulnerable or sensitive) and which are known to occur, strongly expected to occur, or which have occurred in the past within a given forest district. The Identified Wildlife Management Strategy (IWMS) addresses habitat management for specific at risk species, as described in the next section.

1) identified wildlife

'Identified wildlife' refers to species at risk (red- and blue-listed) and to regionally significant species which may be impacted by forest management activities, and which may not be adequately protected by existing management strategies such as those for biodiversity, riparian management, ungulate winter range or through the application of other forest cover constraints. Species at risk as defined under the Forest Practices Code also includes those species that are not considered at risk provincially but which have regional populations that may be threatened. The intent is to address the habitat needs of regionally important wildlife early on, in order to lessen the chance that at a later date they will become listed as threatened or endangered provincially.

While caribou and grizzly bear are listed under the IWMS, provisions for management of their habitat on TFL 56 are separate from the implementation of IWMS, as discussed under *grizzly bear habitat* and *caribou habitat*.

Volume I of the Identified Wildlife Management Strategy (IWMS) was released in February 1999 and details several species which occur or potentially occur within TFL 56 and which require future consideration. These species include the following: bull trout, American bittern, northern goshawk, long billed curlew, fisher, grizzly bear, mountain goat and bighorn sheep. Volume II, which has yet to be released, may identify additional species.

Identified wildlife species will be managed through the establishment of wildlife habitat areas (WHAs) and implementation of general wildlife measures (GWMs), or through other management practices specified in higher level plans. Specific WHAs or management strategies for identified wildlife species have not yet been established on TFL 56, and the licensee therefore applied no specific constraints to account for IWMS provisions in the base case of the analysis.

Government has limited the impact of management for identified wildlife in the short-term to a maximum of one percent of the short-term harvest level for the province. When WHAs are identified or established, and GWMs are implemented, the impacts on timber supply of management for identified wildlife will be more quantifiable. In addition, measures will be assessed over time to determine if they are sufficient to adequately protect identified wildlife species. The identified wildlife strategy and associated timber supply impact thresholds may be changed after such an evaluation, but I cannot

reasonably speculate on the outcome of this process. In addition, I cannot speculate about decisions that may be made during future land and resource management planning processes with respect to identified wildlife. Any future changes to the required measures for identified wildlife species which result in impacts to timber supply, either under the identified wildlife management strategy or according to approved plans, will be incorporated into future determinations.

For this determination, it is not possible to specify the exact location or precise amount of habitat area that will be required within the timber harvesting land base to implement the IWMS. The Province has made a commitment to implementation of the IWMS and policy decisions include a projected one-percent impact on timber supply province-wide. It is appropriate in this determination to account for an expected but not fully quantified impact on the timber supply. Review of sensitivity analysis results in which the size of the timber harvesting land base was reduced indicates that short-term timber supply could be affected. However, in this determination for TFL 56, I am mindful that the licensee has already reserved a large proportion of the timber harvesting land base in MFRAs, and as a result, additional area may not be required to implement the IWMS provisions on the TFL. I will discuss my considerations of this further under 'Reasons for decision'.

2) caribou habitat

TFL 56 forms part of the critical habitat of the Revelstoke caribou herd. This herd of approximately 400 animals ranges north of Revelstoke including portions of the TFL land base. MELP, BCFS and Parks Canada staff have collected habitat and other data about the herd using radio telemetry, aerial censuses, terrain analysis and specific sitings.

Current management on TFL 56 is in harmony with the RMAC strategy provisions for the management of caribou habitat. The RMAC identifies three caribou zones, which in total encompass 44 percent of the timber harvesting land base on TFL 56. Each of the three zones—primary habitat, intermediate habitat and recruitment—has separate forest cover requirements intended to ensure maintenance of the habitat. The forest cover requirements largely relate to the retention of old forest.

During its landscape level planning process, the licensee for TFL 56 worked with MELP and BCFS staff to locate the MFRAs in such a manner so as to meet caribou habitat requirements. As a result, in the analysis the licensee assumed that the MFRAs provided adequately for caribou habitat, and did not model specific forest cover constraints.

The licensee provided graphs depicting the amount of area retained in mature and old seral forest over time in order to demonstrate the extent to which the habitat requirements are met by the MFRAs in the analysis. MELP staff have reviewed the information provided, and note that for the most part, the caribou habitat requirements were indeed met satisfactorily. For those areas where the mature and old seral targets were not initially achieved given the age class structure of the forest, MELP staff are satisfied that the requirements were met as soon as possible in the modelling.

I have reviewed the information regarding the timber supply analysis assumptions for the provision of caribou habitat on TFL 56, and I am satisfied that the approach taken in the analysis to reflect the requirements adequately accounted for caribou habitat. As a result, I make no adjustments for this determination.

3) ungulate winter range

In addition to caribou, TFL 56 provides habitat for other ungulate species such as moose and deer.

In the Columbia Forest District, the district manager has not yet formally designated known ungulate winter range (UWR) areas. Draft mapping completed as part of the RMAC strategy has undergone some revisions by BCFS and MELP staff where appropriate. Winter range areas are expected to be finalized and established either through a higher level plan or under the Operational Planning Regulation provisions by October 2003.

The district manager considers the management recommendations for UWR contained in the draft RMAC strategy to be the best available information for guiding operational practices on the draft UWR on TFL 56. The licensee manages for ungulates on the mapped area by maintaining sufficient proportions of mature and old forest according to the guidance provided by the strategy.

The recommendations for deer include that at least 40 percent of the stands on the operable land base should be older than 120 years of age. For moose, the recommendations reflect intermediate biodiversity emphasis requirements, whereby at least 34 percent of the stands on the operable land base should be older than 100 years of age. Recommendations were also made for minimum patch sizes and crown closure to provide for each species.

In the timber supply analysis, the MFRAs were assumed to provide appropriately for the patch size and crown closure recommendations for ungulate habitat. However, because the MFRAs had insufficient mature forested area to meet the seral stage targets as soon as possible, the licensee applied the forest cover constraints to the operable land base to account for the mature seral retention for both deer and moose.

The licensee provided data in the analysis report which illustrated that the mature seral forest retention in the modelling met the requirements for moose immediately, and for deer after the fourth decade of the analysis horizon.

MELP and BCFS staff have reviewed the assumptions applied in the analysis, and confirm that the UWR areas were modelled in a manner consistent with the requirements of operational practice.

I have reviewed the information about ungulate winter range. I am satisfied that the analysis assumptions reflect the requirements of current management on TFL 56. Although the UWR areas are not yet finalized, I am aware that it is BCFS and MELP policy to use draft mapping for UWR to guide current practice until the ranges are finalized by October 2003. I am also aware that the licensee has committed in its management plan to adhere to the principles of the RMAC, and these principles include the provisions for ungulate habitat modelled in the timber supply analysis. For this determination, I am satisfied that the assumptions in the analysis reflect the best available information, and make no adjustments in this regard.

Any changes which occur when the UWR areas are finalized under the Operational Planning Regulation provisions can be accounted for in a future analysis.

4) grizzly bear habitat

Grizzly bears are present on TFL 56. Although identified as a species under the IWMS, the management requirements for grizzly bear are generally accounted for separately from the IWMS implementation.

The 1995 Kootenay Boundary Land Use Plan (KBLUP) contained recommendations for the management of grizzly bear habitat. The provisions include management of habitat adjacent to avalanche tracks and management of road access and densities in critical drainages. The RMAC strategy also recommends maintenance of forest cover on one side of avalanche tracks, and describes provisions for access management in habitat areas. The district manager has requested consideration of the recommendations in operational planning.

MELP and BCFS staff expect that the requirements for grizzly bear habitat can be accommodated through the assignment of biodiversity emphasis options and the specified old and mature forest retention targets through the landscape unit planning process. No additional timber supply impacts are expected to result from the provisions for grizzly bear management.

As a result, in the analysis the licensee did not model any specific requirements for grizzly bears.

MELP staff state that the assumptions in the analysis are consistent with current practice on TFL 56, and are satisfied that the analysis appropriately accommodates grizzly bear habitat requirements.

Having reviewed the information regarding grizzly bear habitat, I am satisfied that the analysis assumptions were appropriate and reflect the best available information for this determination.

- stand-level biodiversity

Biodiversity is defined as the full range of living organisms, in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems and the evolutionary and functional processes that link them. Under the Forest Practices Code, biodiversity in a given management unit is assessed and managed at both the stand and landscape levels.

Stand-level biodiversity management includes retaining wildlife tree patches (WTPs), within or adjacent to cutblocks to provide structural diversity and wildlife habitat. The *Biodiversity Guidebook* makes recommendations for percentages of area to be retained in WTPs, based on specific assumptions about the land base. *The Landscape Unit Planning Guide* reflects the principles described in the *Biodiversity Guidebook*, and describes the policy on the implementation of biodiversity management.

In addition to the exclusion of the MFRAs as described under *mature forest retention areas*, the licensee also excluded areas for WTPs where the MFRAs were insufficient to meet the spacing requirements described in the Guide. Using table A3.1 in the Guide, the licensee assumed a 6 percent retention for WTPs on those portions of the timber

harvesting land base more than 500 metres from forested non-contributing areas. The licensee states that as a result, the retention assumed in the analysis was greater than 6 percent for each biogeoclimatic variant in each landscape unit, and likely greater than what will be required in current practice.

However, while district staff agree that the retention assumed in the analysis may be greater than required by provincial policy on this account, they state that it likely is reflective of current practice, as they believe the licensee retains more area than required by policy. Wildlife tree patches delineated through operational plans include small pockets of forest believed to be unharvestable because of poor deflection, unstable soils, wet soils, or rock bluffs. Many of these areas contribute towards MFRAs. As discussed under *mature forest retention areas,* in the modelling an excess of area was excluded as MFRAs. Overall, district staff believe that no additional accounting is required.

I have considered this information and agree that any excess retention of WTP area is likely more than accounted for by the MFRA assumptions in the analysis. I accept that the level of wildlife tree retention assumed in the analysis is not greater than that applied in current practice, as suggested by the licensee, but rather reasonably reflects current practice. If there is residual uncertainty about the level of retention, however, I recommend that the licensee and district staff work together to quantify any concerns prior to the next determination for TFL 56.

For this determination, I am satisfied that the analysis assumptions appropriately reflected expected operational provisions to provide for stand level biodiversity.

- *landscape-level biodiversity*

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of old-growth forests for species that are dependent on or are strongly associated with old-growth forests. Although some general forest management practices can broadly accommodate the needs of most ecosystems, more often a variety of practices is needed to represent the different natural disturbance patterns under which ecosystems have evolved.

The delineation and formal designation of 'landscape units' is a key component of a sub-regional biodiversity management strategy. A landscape unit is an area established by the district manager, generally up to 100 000 hectares in size, based on topographic or geographic features such as a watershed, or series of watersheds, to manage biodiversity and other forest resource values. Draft landscape unit boundaries have been delineated for TFL 56. For the analysis it was assumed that all landscape level biodiversity requirements would be met entirely from within the TFL boundaries.

The *Biodiversity Guidebook,* the *Landscape Unit Planning Guide* and *Higher Level Plans: Policy and Procedures* all provide policy and guidance on management for landscape-level biodiversity. The *Landscape Unit Planning Guide* provides guidance on which components of the full range of recommendations included in the *Biodiversity Guidebook* should be implemented to achieve a balance of forest management objectives. The *Landscape Unit Planning Guide* contains forest cover requirements for old seral

forest that are to be applied at the biogeoclimatic variant level within each landscape unit. The requirements are stated as a minimum percentage of the productive forest to be retained in stands above a specified age that varies by ecosystem type. The guide also allows the old-seral requirement to be phased in over three rotations in landscape units subject to a low BEO.

The 1996 Higher Level Plans: Policy and Procedures guide provides further policy guidance. It outlines three biodiversity emphasis options (BEOs)—lower, intermediate and higher—that may be employed when establishing biodiversity management objectives for a landscape unit. To achieve a balance between biodiversity and timber supply objectives, this guide recommends the application of a mix of BEOs in each subregional planning area. The proportions of a planning area subject to lower and intermediate biodiversity emphasis should range from 30 to 56 percent, with the average at approximately 45 percent of the area subject to lower, 45 percent to intermediate, and 10 percent to a higher BEO.

The draft RMAC strategy contains recommendations for biodiversity that vary slightly in some respects from the provincial approach. The strategy describes a set of principles for general biodiversity management tailored to the Revelstoke area, including consideration of connectivity corridors, proportional representation, recommended BEOs and seral targets, as well as recommended management practices to meet biodiversity objectives. Recommended BEOs were delineated along regional connectivity corridors. To minimize impacts to timber supply while still providing for biodiversity values, high and intermediate BEOs for the area were assigned to overlap as much as possible with the management requirements for mountain caribou, ungulates and riparian values. In conjunction with these objectives, seral stage requirements were met proportionally from the total forested land base and the operable land base. Old seral requirements for low BEO areas were permitted to be phased in over three rotations. The RMAC strategy also endorsed the application of patch size variance to enhance resource values, and recommended a 2-metre green-up height.

Within TFL 56, only areas with low and intermediate BEOs have been identified under the RMAC. The RMAC strategy provisions that recommend that old seral requirements be met immediately in high and intermediate BEO areas, but allow the requirement for areas with low BEOs to be met within three rotations were modelled (these provisions are consistent with the *Landscape Unit Planning Guide).* No mature seral objectives are set for low BEO areas under the RMAC.

The draft RMAC strategy recommendations also include the application of a 'proportional' approach; for example, if the landscape level biodiversity constraint requires that 19 percent of a variant be maintained as old growth, then using the 'proportional' approach, 19 percent of the operable land base and 19 percent of the forested land base must be maintained as old growth.

As mentioned under Integrated resource management objectives, the licensee has completed a landscape level plan for TFL 56 that followed the recommendations outlined in the RMAC for landscape level biodiversity. The licensee's delineation of the MFRAs through that planning process was consistent with the assignment of low and intermediate BEOs, and other requirements under the RMAC strategy, such as the requirement of proportionality.

District staff have reviewed the assumptions in the analysis regarding landscape level biodiversity, and confirm that they reasonably reflect the requirements guiding operational planning on TFL 56.

The licensee conducted a sensitivity analysis to evaluate the timber supply implications of modifying the landscape level biodiversity assumptions to reflect the methods normally used in timber supply analyses when landscape units and BEOs are not yet established. Application of an average forest cover requirement weighted to reflect the 45-45-10 mix of BEOs in each draft landscape unit resulted in an additional two decades at the initial harvest level, and higher mid- and long-term levels than projected in the base case.

Review of the analysis results in comparison to the base case indicate that two factors were largely responsible for the results. Under the draft RMAC strategy requirements modelled in the base case, mature seral goals were required to be met in intermediate biodiversity emphasis areas, a requirement not in the policy outlined in the *Landscape Unit Planning Guide*. In addition, the ability to use proportionally more inoperable forest to meet biodiversity goals (i.e., no proportional representation) under provincial policy influenced the results. In total, approximately 1900 hectares of MFRAs were added back to the timber harvesting land base because the area needed to meet management strategies in the caribou and ungulate zones in combination with the other non-contributing forested land base was sufficient to meet old seral requirements.

Although this additional MFRA area is not precisely the same area as the 1800 hectares discussed under *mature forest retention areas*, it likely overlaps to a large extent.

As discussed elsewhere in this document, I am aware that at the time of this determination the RMAC recommendations have not yet been formally accepted by government. In particular, I am aware that the application of a proportional approach is inconsistent with the typical approach taken elsewhere in the province and as described in current policy, whereby forest cover requirements for old-seral stage biodiversity guidelines are assumed to be met first, and to the extent possible, from non-contributing forests. However, given the statutory decision maker's ongoing approval of operational plans based on the recommendations from the RMAC strategy, I accept that these requirements, including the recommended BEOs, seral stage requirements and the requirement for proportionality were appropriate to be incorporated into the base case.

However, I acknowledge that in the analysis, more area than necessary to meet the aforementioned objectives was reserved in MFRAs. With respect to this overestimation, I am taking into account in this determination the implications to timber supply, as discussed under *mature forest retention areas*.

Should the direction on the requirements for landscape level biodiversity for the Revelstoke area change in the future, either through a higher level plan or further policy guidance, then the change can be reflected in a future analysis.

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

Other Information

- operational plans

The licensee annually prepares a forest development plan (FDP) which presents a timber harvesting and forest development strategy for the upcoming period. In its FDP, the licensee for TFL 56 has identified approximately 12 years worth of harvestable volume at the current AAC in approved category A cutblocks.

District staff confirm that the licensee has had no difficulty identifying sufficient operating areas for the future.

Having reviewed the information regarding operational plans, I am aware that the licensee has been able to locate and obtain approval for the eventual harvest of a significant amount of timber under the requirements currently guiding operational plan approvals in the Revelstoke area, which includes consideration of the recommendations arising from the RMAC strategy. This provides me with some indication of the impact of the implementation of the RMAC recommendations on the current operations for TFL 56. I am aware that twelve years of harvest at the current AAC of 100 000 cubic metres can be achieved, even with the RMAC recommendations guiding current operations. However, without further analysis, this information on its own is only of limited value in that it provides no indication of future operational constraints that may arise from implementation of the RMAC recommendations.

I have considered this information in my determination, as discussed under 'Reasons for decision'.

- twenty-year plan

The spatial timber supply model used for the timber supply analysis projected the entire planning horizon in a spatially explicit form. The licensee prepared the twenty-year plan using the output from this model for the first twenty years of the forecast period. The category A cutblocks from the current approved forest development plan (FDP) were included in the modelling and consequently in the twenty-year plan.

District staff have reviewed the twenty-year plan and believe it to be operationally attainable, as well as reflective of current practice and operational plans.

I note that the twenty-year plan provides a good assessment of the short-term operational feasibility of the harvest forecasts in the timber supply analysis.

- Revelstoke and Area Land Use Planning Minister's Advisory Committee

Strategic land use plans establish the broader context for operational plans by providing objectives for managing forest resources in a given area. There are several types of planning processes that are described as strategic in contrast to operational planning processes. Distinctions are made between higher level plans as defined by the Forest Practices Code and strategic land-use planning processes such as regional or subregional planning (land and resource management planning).

Portions of strategic land use plans may be declared as higher level plans under the Forest Practices Code. A higher level plan defined under the Forest Practices Code makes specific objectives or constraints mandatory, thereby setting the resource management context for developing subsequent operational plans.

The Kootenay-Boundary Land Use Plan (KBLUP), a regional planning process, was approved by government in 1995. The people of the Revelstoke area were concerned about the possible impacts to their community arising from the KBLUP, and requested a process to develop their own recommendations to balance the economic, environmental and social needs of the community and the province, and mitigate impacts where possible. Subsequently, government established the Revelstoke and Area Land Use Planning Minister's Advisory Committee (RMAC) to provide advice to the Minister of Forests on the implementation of the KBLUP in the Revelstoke area. The principal task for the committee was to develop recommendations that as much as possible met the goal discussed above.

The final recommendations of the RMAC were submitted to the Minister of Forests in October 1999. The province announced on April 17, 2001 that it had endorsed the recommendations, some of which may ultimately be reflected in a higher level plan order. Although the RMAC strategy is not binding on anyone, current management for TFL 56 and the surrounding area is generally in accordance with the RMAC strategies.

For the area of TFL 56, the primary areas in which the RMAC recommendations differ from standard Forest Practices Code provisions are in the objectives, strategies and practices to provide for biodiversity and caribou. These recommendations were reflected in the timber supply analysis for TFL 56, as discussed under the relevant sections of this rationale.

I am aware that the RMAC recommendations have not been included in a higher level plan. However, I am aware that the RMAC was a detailed, community-based process involving many stakeholders in the Revelstoke area, and the recommendations represent a consensus reached by the participants. Indeed, the RMAC process entailed extensive discussion within the community, involving a broad cross-section of stakeholders, and substantial and high quality analytical support. As described under local objectives, the Minister requested in his letter of July 28, 1994, that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives. In consideration of this request, I am satisfied that the recommendations arising from the RMAC represent an important statement of local objectives for the Revelstoke area.

I am also mindful that in the Revelstoke area, the recommendations arising from the RMAC have been implemented for some time, and the associated implications for land base available for timber harvesting and forest management practices are well understood. I am aware that the licensee, MELP and BCFS staff work together on matters concerning TFL 56 and apply the RMAC recommendations to guide current operational planning and practices for biodiversity, cutblock adjacency and green-up, and caribou habitat. The district manager has considered many of the RMAC recommendations to provide the best available information for management of resources,

and has requested that the recommendations be considered in operational planning by the licensee. More specifically, it is evident that operational plans are now prepared and approved in harmony with the RMAC recommendations.

I am also aware, as discussed under operational plans, that the licensee currently has over 12 years of volume at the current AAC in approved cutblocks on TFL 56. These blocks were approved on the basis of a management regime that reflects the RMAC recommendations. The large volume in category A cutblocks indicates to me that this management regime is implementable in at least the short term on TFL 56.

In consideration of this information, I am satisfied that the provisions arising from RMAC represent a stable management regime which guides current practice on TFL 56, and which is accepted and applied by the parties involved. As a result, although I cannot speculate on the extent to which government may make RMAC strategies mandatory through higher level plans, I am satisfied that the timber supply analysis reflects current approved practices, that in turn reflect the agreement of local stakeholders on management objectives and forest practices.

I also note that, if government creates a higher level plan that changes operational practices from those currently being implemented on TFL 56, then I am prepared to revisit my assessment in the future. As discussed in my guiding principles, I attempt to reflect as closely as possible forest management factors that are a reasonable extrapolation from current approved practices. As new or better information becomes available, it can be considered in future determinations for this TFL.

As a result of the considerations discussed above, I accept the analysis assumptions regarding the RMAC recommendations, with the exception of the specific considerations discussed in this rationale document.

- harvest sequencing

In the timber supply analysis, harvest priority was placed on specific zones in an attempt to emulate patch size considerations, which in part guide current operational practice. In addition, priority was placed on the oldest available stands that met minimum harvestable age criteria.

Sensitivity analysis results indicated that changing the harvest priority had very little effect on timber supply. Removal of the oldest first harvest priority led to a decrease in timber supply of 4 percent in decades 11 and 12. Otherwise, timber supply was not sensitive to modifications to the harvest priority applied in the analysis.

I have reviewed the information regarding the harvest sequencing assumptions in the analysis, and am aware of no issues which would impact this determination.

- First Nations considerations

There are no First Nations communities in the vicinity of TFL 56. However, the Ktunaxa-Kinbasket, Shuswap and Okanagan Nations have asserted traditional territories within the area of the TFL. The Ktunaxa-Kinbasket Tribal Council, on behalf of the Ktunaxa Nation, has submitted to the provincial government a comprehensive land claim covering the south-east corner of the province, including part of TFL 56. The Shuswap Nation Tribal Council, though not participating in the formal treaty process, have stated their interest in taking part in some form of negotiation with the provincial government regarding their asserted traditional territory.

The licensee indicates in its management plan that it received several letters from First Nations regarding the impact of harvesting in the TFL on their traditional territories.

As discussed under my 'Guiding Principles', the AAC that I determine should not in any way be construed as limiting the Crown's legal obligations, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within TFL 56. I further note that it is inappropriate for me to attempt to speculate on the impacts on timber supply that will result from decisions that have not yet been taken by government. As any decisions on treaty negotiations are undertaken by government, they will be reflected in future timber supply analyses for the TFL.

(b) the short and long-term implications to British Columbia of alternative rates of timber harvesting from the area,

Alternative rates of harvest

- harvest flow/socio-economic implications

The nature of the transition from harvesting old growth forests to harvesting second growth forests is a major consideration in determining AACs in many parts of the province. In the short-term, the presence of large timber volumes in older forests often permits harvesting above long-term levels without jeopardizing future timber supply. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that current and medium-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest level. Thus, timber supply should remain sufficiently stable so that there will be no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

Several alternative harvest forecasts were provided by the licensee. In the first projection, the initial harvest level was set at the highest level possible level which did not compromise mid to long-term harvest levels. In this forecast, 115 000 cubic metres per year was attainable for one decade, after which it decreased over five decades to 70 000 cubic metres per year for six decades. The harvest level rose to 74 000 cubic metres per year in decade 12.

The second alternative harvest forecast provided by the licensee tested the ability of the timber supply on TFL 56 to support harvest at the level of the current AAC for as long as possible, without consideration of mid to long-term impacts. In this harvest forecast, the initial harvest level could be maintained for 50 years before falling sharply in the sixth decade. Several other timber supply disruptions occurred in the tenth and twenty-first decades, in this harvest projection.

In the third alternative harvest forecast, the initial harvest level was maintained for as long as possible before dropping in one step to a level approximately the same as the base case long-term harvest level. This forecast indicated that under these parameters, the initial harvest level could be maintained for four decades before dropping to 70 000 cubic metres per year, and then rising in decade 15 to the same long-term harvest level projected in the base case.

The final harvest forecast illustrated the harvest level possible if the initial harvest level is set immediately at the long-term harvest level. In this forecast, a non-declining even flow harvest level of 75 500 cubic metres per year was maintained throughout the analysis horizon.

The results of these alternative harvest flows provide me with a useful assessment of the timber supply dynamics over the term of the analysis horizon. In particular, the results indicate to me that there is some flexibility in the short and mid-term for the timber supply on TFL 56.

- community dependence on the forest industry

As mentioned under Timber processing facilities, the licensee for TFL 56 does not operate a sawmill. However, it does operate a log yard, and supplies 50 percent of the sawlog volume harvested from the TFL to local industry partners. The volume provided to industry partners is for the most part utilized in Revelstoke mills. The remaining volume, which is sold from the log yard, may be but is not required to be processed locally.

The licensee indicates in its management plan that it directly employs five full time persons, and up to a further 88 persons directly through contracts for cruising, engineering, road building, logging, silviculture and the log yard. The licensee estimates that the volume from the TFL provides a further 38 person years in solid wood and pulp processing employment. Due to the history behind its inception, the licensee indicates that it places a distinct focus on providing local community benefits for the operations on TFL 56.

Having reviewed this information, I am aware that the local community of Revelstoke has employment-related and other dependencies on the timber harvested from TFL 56. Consideration of the implications for the Revelstoke community is an important factor in my determination of an AAC for TFL 56.

- difference between AAC and actual harvest

As a normal standard, most licencees have some flexibility in their annual rate of cut during a five-year period referred to as the cut control period. The volume harvested must be within 50 percent of the allowable annual volume in each year (annual cut control), and also within 10 percent of the allowable volume for the five-year period (periodic cut control).

District staff indicate that the licensee met cut control requirements satisfactorily in the 1993 to 1997 cut control period, and is expected to also meet the requirements of the current period.

I have reviewed the information and am aware of no issues which would impact this determination.

Partitioned component of the harvest

In his previous AAC determination for TFL 56, the chief forester included a partition of 10 000 cubic metres per year to those stands above the 1994 operability line.

Since that time, the licensee has performed extensively in stands above the 1994 operability line, and as discussed under *economic and physical operability*, a large area previously delineated as inoperable is now included in the operable land base. The stands in which the licensee has performed and the volume from which has been attributable to the partition are now included as part of the conventionally operable land base.

District staff indicate the licensee has performed to their satisfaction in the partition, and that a partition is no longer required for TFL 56. Licensee staff also indicate their support for removal of the partition, as they have performed and continue to perform adequately on the timber harvesting land base.

I have reviewed the information regarding the partition from the 1996 AAC determination for TFL 56, and I am satisfied that a partition is no longer warranted. As such, I will discuss the removal of the partition under 'Reasons for decision'.

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

Timber processing facilities

The licensee for TFL 56 does not operate a sawmill, but does operate a log sort yard. Under the licence agreement the licensee must provide 50 percent of harvested volume to local industry partners in Revelstoke. The balance of wood harvested on the TFL is sold on the open market. The licensee indicates that typically 35 to 40 percent of the annual volume harvested is pulp quality logs.

I have reviewed the information regarding timber processing facilities, and I am aware that although the licensee does not operate its own mill, the timber harvested from TFL 56 does support local processors, and therefore contributes to the stability of the economy in the area.

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia,

Economic and social objectives

- Minister's letter and memorandum

The Minister has expressed the economic and social objectives of the Crown for the province in two documents to the chief forester—a letter dated July 28, 1994, (attached as Appendix 3) and a memorandum dated February 26, 1996, (attached as Appendix 4). These economic and social objectives are an important consideration in my determination of an AAC for TFL 56.

This letter and memorandum include objectives for forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter of July 28, 1994, that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs.

I have considered the contents of the letter and memorandum in my determination of an AAC for TFL 56. As discussed under *incremental silviculture* , I am satisfied that opportunities for commercial thinning on TFL 56 are insignificant at this time. In addition, as discussed under *economic and physical operability*, I am satisfied that the licensee has thoroughly explored operability on the TFL land base, and that no significant additional opportunities for harvesting in previously uneconomical areas exist at this time.

Based on the licensee's performance over the term of Management Plan No. 2, I am satisfied that the partition from the 1996 determination is no longer required on TFL 56. My considerations of this are discussed under Partitioned component of the harvest. In addition, I do not believe that a partition to the helicopter operable stands discussed under *economic and physical operability* is required in this determination.

The Minister's memorandum addressed the effects of visual resource management on timber supply. In it, the Minister asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. TFL 56 contains limited visually sensitive area, and I am satisfied that the visually sensitive resource was appropriately modelled in the timber supply analysis.

- local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives.

As discussed under *Revelstoke and Area Land Use Planning Minister's Advisory Committee*, I accept that the recommendations arising from the RMAC strategy provide an expression of local objectives for the Revelstoke area.

The licensee for TFL 56 states in Management Plan No. 3 that the people of Revelstoke have a special stake in the TFL and the licensee's operations, given that the Corporation was established as a result of the desire for more local involvement in forest management decisions. The licensee indicates that it continues to provide for public consultation opportunities, including the holding of annual public meetings, and the provision of a copy of its annual report to all households in Revelstoke.

The licensee also indicates in its management plan that it actively solicited public input on Management Plan No. 2, on the statement of management objectives, options and procedures (SMOOP) for Management Plan No. 3 and on the draft management plan. Open houses were held by the licensee for the SMOOP and draft management plan. A limited number of public comments were received, largely related to operational considerations such as species selection for reforestation, and strategies for enhancing wood quality.

The licensee has responded to the public comments where possible. District staff confirm that the licensee met its public input obligations satisfactorily.

I am satisfied that the licensee has carried out its public involvement obligations, and that no specific issues were identified in public review which would impact this determination.

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Abnormal infestations and salvage

A number of parasites, fungi or plants can kill trees or degrade the quality and value of logs. Unsalvaged losses are timber volumes destroyed or damaged by causes such as fire and disease that are not recovered through salvage operations.

Estimates for unsalvaged losses account for epidemic (abnormal) infestations that are not incorporated into yield estimates used in the analysis. Timber volume losses due to insects and diseases that normally affect stands (endemic losses) are mostly accounted for in inventory sampling for existing timber yield estimation or though other methods. Losses associated with second-growth stands are addressed by application of operational adjustment factors (OAFs) as noted previously in this rationale.

For an estimate of losses as a result of fire, the licensee used the average loss from a review of 20 years of past fire history records. A five year average of windthrow losses, and a seven year average of epidemic pest losses were added to this value, for a total estimate of 955 cubic metres per year. This volume was deducted from the timber supply projections for the entire analysis horizon to reflect expected unsalvaged losses.

District staff have reviewed the estimates for unsalvaged losses. Although the value used appears low, they have reviewed the work conducted by the licensee and are satisfied that the values are substantiated by the data. Staff believe that the estimates provide a reasonable reflection of actual losses experienced on the TFL.

I am aware that the licensee has done considerable work to analyze historical losses and I commend it for those efforts. Although the values are lower than those used in adjacent units, I am satisfied from review of the information and discussions with district staff that they provide a valid accounting for non-recoverable losses, and make no adjustments in this regard.

Reasons for Decision

I have considered the information discussed throughout this document, and I have reasoned as follows.

For the reasons stated in 'Timber Supply Analysis' and from reviewing the considerations as recorded above, I accept that the licensee's base case forms an appropriate basis from which to assess timber supply for this AAC determination.

In determining this AAC, I have identified factors which, considered separately, indicate that the timber supply may be either greater or less than that projected in the base case. Generally some of these factors can be quantified and their impacts assessed with some reliability. Others may influence timber supply by adding an element of risk or uncertainty to the decision but cannot be reliably quantified at this time. These latter factors are accounted for in determinations in more general terms.

The area of TFL 56 falls into the area considered by the Revelstoke and Area Land Use Planning Minister's Advisory Committee (RMAC), the history and purpose of which is discussed under *Revelstoke and Area Land Use Planning Minister's Advisory Committee*. In that section, I also provide my reasoning regarding the appropriateness of the reflection of the RMAC recommendations, to the extent that they are reflected in current approved practice, in this determination.

In this rationale, I have identified several factors for which I believe the base case assumptions differ from current operational practices or conditions. These factors are summarized below.

There are a number of factors which indicate that timber supply may be greater than projected in the base case in the mid to long-term, as follows:

- *site productivity* - I believe that the future productivity of sites currently occupied by old growth stands has likely been underestimated in the base case harvest projection. As a result of this underestimation, mid- to long-term timber supply may be underestimated by up to 18 percent;
- *use of select seed* – The licensee did not assume any contribution from select seed in the base case. I believe that gains in regenerated stand yields as a result of the current use of improved seed leads to a 1 percent increase in long-term timber supply;
- *MFRAs*- I accept that the overestimation of area required in MFRAs to meet objectives for biodiversity and wildlife leads to the possibility that the short-term harvest level could be maintained for an additional period of time, and that mid to long-term timber supply may be underestimated.

One factor indicate that timber supply may be slightly overestimated in the base case projection, as follows:

- *identified wildlife* – I conclude that the eventual establishment of WHAs and other measures to manage for identified wildlife may result in a decrease of up to 1 percent on mid- to long-term timber supply.

In addition to the factor above, I am also aware that some uncertainty exists regarding the operability of the hemlock-leading stands currently identified as operable by helicopter, which may in the longer term act to decrease timber supply if these stands prove to be inoperable. However, as discussed earlier in this document, I accept the inclusion of these stands in the timber harvesting land base and the commitment from the licensee to report on harvesting performance.

As discussed earlier in this document, the extent of the overestimation of MFRA areas is subject to considerable uncertainty. I accept the use of these reserved areas as a good proxy in the modelling for the operational management considerations for caribou, ungulate winter range and landscape level biodiversity. However, I am aware that the size and eventual status of these areas will change over time. I expect that in the longer term, the management requirements for these areas will become clearer.

In consideration of the Keystone Standard LRUP area, I note that the status of this area has not formally been determined by government. In consideration that government previously chose to not protect this area under the provisions in the KBLUP, I am not certain that protected status will be declared for the area in the future. While this area does not contribute to the timber harvesting land base in current practice, the eventual status of the area is not clear. It is possible that the long-term use of this area may indeed incorporate timber harvesting activity if it is compatible with the other resource values present. In any event, these matters will be decided through public process and government decisions on land use, and I cannot speculate on the matter.

The two factors described above indicate that the timber harvesting land base may be somewhat larger than assumed in the base case.

However, the harvest flow projected in the base case indicates a mid-term decline in timber supply. In consideration of the various factors acting to increase timber supply, I am satisfied that no factor or combination of factors could serve to eliminate a mid-term

decline in harvest levels for TFL 56. Therefore, it would not be appropriate to increase the harvest level at this time, given the projected decline in the mid-term before the attainment of the long-term harvest level.

However, in general, the timber supply for TFL 56 appears fairly stable and in fact may be greater in the mid to long-term than projected in the base case harvest forecast. As better information becomes available about site productivity and the use of select seed, the timber supply implications for the future will become clearer. Likewise, as the management regime for TFL 56 continues to be implemented, and as the objectives for MFRAs and other values become clearer, it is possible that the mid- and long-term harvest projections for TFL 56 may be greater than shown in the base case.

In fact, future analyses for TFL 56 which incorporate modifications in assumptions—such as those around site productivity, the MFRA areas and genetic improvement—to capture the evolution of operational practice and knowledge may indicate that the long-term harvest level may already be closer to the current harvest level than indicated in the current analysis.

I am therefore satisfied that an appropriate harvest level for TFL 56 is 100 000 cubic metres per year, the initial harvest level projected in the base case, and that is unchanged from the current AAC. In addition, as discussed earlier in this document, I am satisfied that the partition in the current AAC of 10 000 cubic metres to areas above the 1994 operability line is no longer required.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties of the information provided. It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved on TFL 56 by establishing an AAC of 100 000 cubic metres.

This determination is effective April 18, 2001, and will remain in effect until a new AAC is determined, which must take place within five years of this determination.

If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than the five years required by legislation.

Implementation

In the period following this decision and leading to the next AAC determination, I request that the licensee:

- Reconcile the forested area suitable for inclusion as timber harvesting land base discussed under *non-productive and non-forested reductions*;
- Work with district staff to clarify management objectives for the Keystone Standard Basin Local Resource Use Plan area;
- Report on harvesting performance in helicopter operable stands.

In addition, I encourage the licensee staff to undertake the tasks noted below, as discussed throughout this rationale document. I recognize that the licensee's ability to undertake these projects is dependent on available staff resource time and funding. However, these projects are important to help reduce the level of risk and uncertainty associated with key factors affecting timber supply on TFL 56. I recommend that the licensee:

- Continue to refine the site productivity loss estimates for areas subject to group selection;
- Continue to collect site productivity data and compare estimates derived from the inventory data to field values;
- Review the criteria and methodology for minimum harvestable ages to ensure it provides the best reflection of operational considerations;
- Collect data to better estimate volume losses resulting from armillaria, and refine OAFs correspondingly.

Ken Baker

Ken Baker
Deputy Chief Forester

April 30, 2001

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, reads as follows:

Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (1) (a) to (d),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to

(a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and

(b) different types of timber and terrain in different parts of private land within a tree farm licence area.

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

(iii) silviculture treatments to be applied to the area,

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

   (a) encourage maximum productivity of the forest and range resources in British Columbia;

   (b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;

   (c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;

   (d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia; and

   (e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Documents attached:

Appendix 3: Minister of Forests' letter of July 28, 1994

Appendix 4: Minister of Forests' memo of February 26, 1996

File: 10100-01

JUL 28 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

Province of
British Columbia

Minister of
Forests

Parliament Buildings
Victoria, British Columbia
V8V 1X4

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
OFFICE OF THE MINISTER

Ministry of Forests

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: The Crown's Economic And Social Objectives Regarding Visual Resources

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

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In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis*.

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests